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Online doctor chat – Digitalization of health care in practice: A case study

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Digitalization is predicted to one of the major solutions to many of the issues, that health care is facing in the future. This digital transformation is already affecting also to how health care services are being delivered and this has also implications to the work of health care professionals. Digitalization affects also on the development of telemedicine services and the purpose of this study is to investigate one form of telemedicine, online doctor chat service of a private health care company Mehiläinen, more in-depth and to provide an example of digitalization of health care in practice. The focus of this study is in the work of a medical doctor in a chat-based service model and the aim for this study is to learn about the special characteristics of treating patients through a chat-based service, learn about the advantages and shortcomings of this kind of service model and to learn more about the requirements and attributes that a medical doctor should possess in this kind of clinical work. In addition, this study aims to learn more about the overall perceptions and attitudes toward telemedicine currently, among the community of medical doctors in Finland.

A mixed method was chosen as the methodology approach for this study, with both qualitative and quantitative data collected. The qualitative data was collected by conducting semi-structured interviews and the collection of quantitative data was done in the form of a questionnaire. The balance of data was chosen to be qualitative dominant. Thematic analysis was used for analysing the data.

The results of this study showed, that there is a lot of advantages in a doctor chat service and a lot of potential for future development. This kind of service model provides efficient solution to many kinds of situations. But there are risks as well, in a general level but also for the physicians working through it. Many of these risks are connected to the characteristics of this kind of service model, that is based only on text and images. The results showed also, that the overall perception towards telemedicine can be described as cautiously curious. Adoption of telemedicine still requires time, more first-hand experiences and more emphasis on the training of medical doctors in telemedicine and eHealth. This kind of doctor chat service can still provide great value for physicians and patients and can also bring societal benefits, as long as the special requirements and shortcomings are considered.

Keywords	telemedicine, doctor chat, digitalization of health care, eHealth, technology emitted interaction

Contents

Preface

The process of writing this thesis begun in the fall of 2018 with making preliminary plans for the process and going back and forth between different kind of ideas for the topic of the research. After the topic was chosen, the project was introduced to Mehiläinen and shortly after that, the thesis process was officially started. After researching the theory and finalizing the literature review, the data collection was started in the fall of 2019, by interviewing medical doctors of the Mehiläinen Digital Clinic and by conducting the questionnaire. All but one of the interviews were finished at the end of October 2019. On December 31 the World Health Organization was informed about cases of pneumonia from the city of Wuhan, China, with unknown causes. The virus, later identified as the SARS-Cov-2, was found to be the cause for the diseases, which was named as COVID-19. The first reported incident of COVID-19 in Finland was found from a Chinese tourist on 29th of January. On February 26th, six days prior to the last interview conducted for this thesis, second COVID-19 positive was confirmed. The virus spread and on March 16th the state of emergency was declared in Finland due to COVID-19. On the same day, measures for isolation and lockdown were announced (Finnish institute for health and Welfare, 2020).

The pandemic had immediate effects on the demand of telemedicine services in the country, the Digital Clinic of Mehiläinen included. The demand for the Digital Clinic grew over 300% in matter of days. Tens of new physicians were recruited in the following weeks to help with the growing demand and the administrational and technical staff, ensuring that the platform could keep up with the volumes, made sure that everything kept running. For many of the patients, this was the first time they used telemedicine services.

It is obvious, that this pandemic will have a big impact on the future of health care, for all. It will no doubt affect also on the future of telemedicine, and on the way how people use health care services after this. It is also obvious, that if the data collection for this thesis was conducted now, after the global pandemic hit, it would affect also on the results and the data that was used in this case study might look somewhat different. A crisis this big might distort some of the opinions and experiences of the medical doctors working in the middle of this. From this perspective, the data that was used in this study,

represents the real perceptions and experiences just before the crisis broke, giving so maybe more objective results on the research problems.

As the COVID-19 pandemic was not part of the data collection process for this thesis, the pandemic is not covered at all during the rest of this thesis. This preface was the last part written in this thesis and at this moment, the future development of the pandemic is unknown.

Vantaa, Finland 7.5.2020

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1 Introduction

Digitalization and development of digital services is one of the major trends within most industries currently. With health care, digitalization is seen as one of the biggest developmental stages within the industry and it is also predicted to be one of the major solutions for the pressing issues regarding health care in general. Aging population, demand for equitable care regardless of any geographical restrictions and the growing costs of health care are all major issues facing the future of health care. Digitalization and eHealth services can provide solutions to many of these issues (Alkhaldi et al., Blumenthal and Glaser cited in Doolin 2016:353).

As the digitalization of health care services is evolving in a fast pace and eHealth services are getting more common rapidly, the whole digital transformation seems inevitable. Even the terminology is changing constantly and as recently as March 2019 the World Health organization suggested that as a part of their Global Strategy on Digital Health 2020-2024, that the term Digital Health is selected over eHealth to “embody integration of concepts yet be flexible enough to foster diversity of purposes, technologies and other specificities” (WHO, 2020). For the sake of clarity, eHealth is the term still used in this thesis. This rapid and ongoing developmental phase has implications and effects on future patients but also on the way health care professionals of several different fields and specialities conduct their work in the future. Telemedicine, defined simply as supporting medical services through the use of telecommunication, is not a new thing and telemedicine as a concept has been in use for decades already. Still the development of digital tools, networks, applications and systems has led to development of telemedicine services and these services are getting more common. Online medicine, or more specifically chat doctor services is one of these new forms of telemedicine and this is the environment where the research of this thesis focuses on. There are many special characteristics in the clinical work of a medical doctor. There is no doubt a great importance in the face-to-face contact between physician and a patient, but what kind of effects are there, when the clinical work is done remotely? How do the physicians perceive telemedicine as a way of practicing their profession, what kind of benefits and also challenges there are to this form of telemedicine, what kind of skills and attributes are demanded from a medical doctor providing telemedicine services via chat and what are the overall perceptions and attitudes towards telemedicine with physicians in Finland today? These questions are the focus point of this thesis.

This thesis has been made in cooperation with Mehiläinen. Mehiläinen is one of the biggest private providers of health care and social services in Finland and they offer services for private, corporate and municipal customers. Mehiläinen has had digital technology as a part of their services for several years already. Their online service platform offers several services for customers from their personal electronic medical record to the Digital Clinic telemedicine service. This Digital Clinic and physicians working with it are the main source for the data collection for the research of this thesis. In addition, other physicians with or without experiences on telemedicine have also been used as a source (Mehiläinen, 2019).

Theoretical background

2 e-Health

Health care is in its very nature an information based and information-oriented process. Much of the process is based and guided by various sources of information and data from patient information to for example information on diagnosis and treatment of a specific health issue. The treatment of patients usually relies on information from patient's medical history, especially in long term treatment. Medical research relies on information learned and documented previously from past experiences and the management and service planning of health care is based on data of various sources. Due to the sheer volume of information needs of health care and the many actors using the information (health care professionals, clinicians, managers, patients, government etc.), a large variety of information technology and systems have been built around it. This digitalization of health care is commonly associated with the term "e-Health". E-Health as a definition is broad and it is somewhat unclear what it encompasses in entirety, but as a generic way it can be described simply as the use of ICT (Information and Communication Technology) in health care context (Doolin, B. 2016: 352).

The implementation of e-Health has been developing in fast pace with the overall digitalization of industries and the development of technologies and information systems. The technological development is happening at such a fast pace that new e-health innovations are being introduced constantly and ICT in health care is huge business already, not just in organizational but individual consumer level as well. Therefore e-Health is one

of the biggest developmental stages of health care in its history and why it is believed to offer solutions to many of the pressing issues regarding overall health care. E-Health is predicted to be the driver for wide range of changes to health care practices and to improve the quality and efficiency of health care services overall (Alkhaldi et al., Blumenthal and Glaser cited in Doolin 2016:353).

2.1 e-Health as a driver for change

Aging of the population is one major challenge that is causing governments and decision makers around the world to evaluate the capabilities of their health care systems and services now and in the future, to meet the increasing demand. According to the World Health Organization (2020), we are currently reaching a point, where there are more people in the world aged 60 years or more, than there are children younger than 5 years, and the estimate is that by the year 2050, the population aged 60 years and older will be expected to be total of 2 billion. The aging of the population means that there will be a bigger need for health care professionals, who can provide quality care also to the geographically challenging locations. The need for elderly and long-term care will continue to rise rapidly in the following years and the big demographic change will cause countries to plan and implement health care reforms and develop their health care services. In addition to aging of the population, life expectancy is also increasing. This is in big part caused by the development of health care services. As Mintzberg (2017: 16) suggests, health care is suffering from success. There are wider range of treatments available to illnesses and specific conditions and the treatments of symptoms are getting more complex and advanced. General knowledge on health-related issues is getting better and people are more interested on their own well-being and measures achieving that. But this has also resulted in health care becoming more and more about treatment of diseases and symptoms with wide range of cures instead of focusing on prevention of illnesses and promotion of general health. All of this has also caused the cost of health care to rise, which is by far one of the most pressing issues concerning health care. (Doolin, B. 2016: 354). E-Health and the implementation and integration of information and communication technology into health care services is seen as one of the main solutions to solve these challenges as the technologies, applications and other services are developing. E-Health is expected to raise the quality of care and better the overall safety of patients and reduce medical errors. Computerized systems offer better tools for the clinician to make right decisions on patient care. The distribution of medicine is easier

and more efficient through the computerized systems. E-Health and the development of e-Health has been ongoing currently mainly in economically developed countries, but the use of ICT based solutions should be increasing also in developing countries, even though there are several other issues making it challenging (Doolin, B. 2016: 354).

2.2 The many Implementations of e-Health

The implementation and the development of e-Health is a constantly ongoing process. The development processes are affecting services on health care organizations on organizational level but also a large variety of wearable health devices are becoming more and more common on an individual consumer level as well. The development process is moving fast, and it has implications on many levels of health care. And there are many things that must be taken into consideration, especially when dealing with information on medical records for example. As Agarwal et el. (2010) states, “Determining how best to manage the [health] IT implementation process… is possibly one of the most pressing health policy issues” (801). The use of IT and ICT has already now a big role in health care as most of health care services rely on this kind of information generated and processed by IT related functions, regardless if you are a clinician, patient or other health care professional.

2.2.1 Electronic Medical Record (EMR)

Electronic Medical Record (EMR) is one of the main forms of ICT related health care functions that is being used daily in health care. EMR is basically a digitalized version of documented medical record of a single patient for example. The physician can access previous data of a patient regarding treatments, conditions, traumas, previously ministered medications, laboratory test results, x-rays etc. and make clinical decisions of current cases if not based, at least influenced by the previous medical history of the patient. The use of EMR can make the use of medical data of a patient more efficient and it to be shared between several specialists for example if needed. The main benefit is the access of updated medical data for the clinician at the point of care. And as the data can be accessed by multiple users, different specialists for example, it makes the process of patient care more efficient. The data used and gathered in EMR can be for example through the interface from Picture Archiving and Communication System (PACS), which stores imaging and radiology information of patients that can be used by clinicians for

clinical decision making. Once again, the main benefit is the capabilities to share data between physician and radiologist, making the whole care process more efficient. EMRs are evolving also and are not being used just as a source information, but also as a tool for entering specific orders regarding the care of the patient. These orders can be for example orders for medications or laboratory tests. The orders can be made through Computerized Provider Order Entry (CPOE), which has an interface with the EMR. CPOE also transfers the orders electronically and the results are returned to the system. E-prescribing is also a function that is incorporated in CPOE. E-prescribing makes it possible to electronically prescribe and transfer prescriptions between the prescriber and the pharmacy. E-prescribing has functions for clinicians for example to customize lists of frequently used orders or maintain and monitor incorrect prescriptions etc. Prescriptions prescribed through e-prescribing makes it also convenient for the patient to handle his/her prescriptions. There is no need for paper prescriptions anymore and the data is easily accessible basically by any pharmacy. The renewal of prescriptions for regular long-term medications can be also be easily managed through e-prescribing without a face-to-face meeting with the patient and the physician, if it is not needed. For the clinician's work, clinical decision support system (CDSS) can be incorporated in the EMR. CDSS is a computerized system with a clinical database on wide variety of medical conditions and issues. CDSS can provide case-specific information and advice on a given issue regarding the baseline information the clinician inputs to the system on a patient and the system can improve clinical decision-making (Doolin, B. 2016: 356-357).

2.2.2 Electronic Health Record (EHR)

As EMR, also referred as electronic patient record, is known as patient record of a single health care provider, an electronic health record (EHR) is "a longitudinal collection of patient-centric health care information available across providers, care settings, and time" (Rosenthal, 2006). EHR has a significant part of any health information systems of any given geographical area. (Doolin, B. 2016: 357). EHRs database can be used and its data exchanged between different health care organizations for more efficient care of patients and the care can be also personalized based on the individual data. As the information on EHR can be shared across different organizations, there needs to be interfaces implemented between different systems. Sharing of medical information across different systems demand more emphasis on data security and privacy matters, but

EHRs nevertheless have big influence on the efficiency of health care delivery (Doolin, B. 2016: 358).

2.2.3 Personal Health Record (PHR) and mobile applications

One aspect of health care, where digitalization has also played a big role, is the increasing interest on own personal health. This has resulted in the implementation of personal health record (PHR) which supports and empowers individuals to be more interested on their own health, but also manage it. Health information is more accessible through the internet for example and the technological development has brought several kinds of wearable consumer products on the market, which can be used to monitor health related variables. As Dansky, Thomson and Sanner (2006) stated, “Health care is in the midst of a consumer-oriented technology explosion” (397). People are now able to manage their own health and well-being with electronic tools which are linked to health databases where it is possible to compare your results to predetermined reference values on a specific area of health. There are several providers through the data can be managed and inspected. These providers include health information websites, educational resources, social media networks that are linked to health care and different kinds of online health communities. Wearable health devices and the data they gather are also used in more systematic way and not just as a means for consumers to monitor their wellbeing. For example, in geriatric care and home care health, bracelets are used to monitor patient’s health data and the bracelets work also as a monitoring and alarm system, should there be any rapid change in the patient’s condition that should require immediate medical attention (Doolin, B. 2016: 359). The development of mobile devices and different kinds of applications (apps) has influenced health care as well. The use of mobile devices for health care purposes has affected in the growth of medical soft-ware applications development. And this development has helped the patients, but health care providers as well. Mobile apps have influenced, for example, information and time management between clinicians and patients, health record maintenance, communication and consulting and medical education and training. Mobile devices and apps have proven to be beneficial to health care professionals as point-of-care tools, which have been shown to result in better clinical decision-making (Ventola, 2014). The use of mobile apps in health care can be seen also in the management of rota planning for medical personnel. For instance, private health care companies are investing also in the development of mobile tools for managing workforce. This has benefits especially in hospital and health station

environments, where there is the constant and often irregular need for emergency duty personnel or health care professionals on call.

2.2.4 Mobile health (mHealth)

The development of mobile devices has not only helped software developers to bring countless amount of health-related mobile applications to the market for private consumers, but it has also made a big impact on how health providers can distribute their services. This mobile health, or mHealth, can also be defined in many ways, but WHO defines mHealth as “the use of mobile and wireless technologies to support the achievement of health objectives” (WHO, 2015). As mobile phones and tablets have evolved from basic devices to the powerful and capable smart devices of today, the possibilities for more versatile mHealth services have grown rapidly during the last decade. Even the simplest mobile phones today can send and receive health-related data with short message service (SMS), which basically can be viewed as a form of telehealth. But the real potential is with the smart devices, which can store large amount of data, gather all kind of health related data of the user with built-in sensors, offer two-way transmittal of high resolution images and videos and utilize a synchronous communication of patient and health worker either by voice, video conferencing or text. As especially in developed countries, usage of smart phones is highly common which opens a lot of opportunities for many kinds of remote care (Iyengar 2019: 277-279).

2.3 Challenges of e-Health

E-Health is thought to offer solutions to many of the problems within the health care sector. This and the fast development of technologies have resulted in large range of development projects regarding health technology and all kinds of other implementations. But health care has some special characteristics, which also influence in the success of these eHealth innovations. Because health care is so complex, it is to believe that eHealth has not reached its full potential yet. Many projects have been abandoned and failed because of this complexity, which has resulted in under-used systems and financial loss (Van Gemert-Pijnen et al. cited in Doolin 2016: 360). ICT and IT projects in health care share many of the common challenges of IT projects in general. Technologies in use, source and validity of data, performance of the system, risk management, funding etc. all influence on the IT project development. In addition to these, there are

factors that are associated to the field of health care, like personal medical data for example. Privacy issues and protection of medical records is one of the important factors that must be taken into consideration when implementing e-Health solutions. Data transfer has major security concerns and when dealing with sensitive health related information, there needs to be extra precautions to ensure the protection and confidentiality of the data (Doolin 2016: 360).

While many of the e-Health services we have already in use for patients and health care professionals has several benefits, they have risks as well. With the electronic medical record there is the risk of unauthorized access of information and while the EMR mainly makes the work of the clinician more effective and faster, possible technical problems have the opposite effect, when relying only on data from the EMR. The more versatile the digital tools are becoming, there is a risk of affecting the actual communication and interaction between the clinician and the patient. If the clinician is relying too much on the digital tools, like the clinical decision support system for example, and not having enough interaction with the patient, there is an added risk for error in diagnosing the patient. And the experience for the patient might feel distant (Doolin, B. 2016: 357). The implementation of these IT systems is also often problematic. Costs related to these implementations can easily go over budget. There are also other financial, social, legal and ethical factors in play that can affect the implementation processes. On top of this the cost effectiveness and the factual benefits of the system developed can be inadequately researched (Ross et al. 2015).

As Mair et al. (2012) point out, “implementing and embedding new technologies of any kind involves complex processes of change at the micro level for professionals and patients and at the meso level for health care organizations themselves” (357). Change usually meets resistance in organizations. And as Denis, Langley and Rouleau (2007) suggests, health care organizations are “pluralistic organizations” characterized by diffuse power and authority between clinicians, managers and other groups. Change in health care organizations is for that reason even more complex (Sergi, Comeau-Vallée, Lusiani, Denis & Langley 2016: 210). It is also common that these kinds of complex processes lead to unintended results as complex implementation projects are hard to predict. There might be unwanted and unbudgeted costs and other errors for example. EHealth implementations need a lot of testing and the best practices and systems are discovered only through practical use in real surroundings (Doolin 2016: 362-363).

3 Overview of Telemedicine

Telemedicine as a service is one that has benefited greatly from the digitalization of health care services and mobile applications. Telemedicine is defined simply as supporting medical services through the use of telecommunication. The purpose of telemedicine is to provide medical services over distance to, for example, geographically challenging locations. There are many forms of telemedicine, but mostly it is an exchange of information between clinician and a patient. Through telemedicine, the purposes of the services could include bringing services to larger groups of people in any given regions, make health care services more affordable to all, optimize health for all ages, provide preventive care in addition to emergency treatment, remote rehabilitation monitoring and to ascertain service reliability and eliminate human errors. For these reasons there is a growing trend of implementing telemedicine services around the world (Fong, Fong & Li 2011: 4-11).

Telemedicine as a term is often incorporated with telehealth. With telemedicine, there is a contact with a patient and a clinician and telemedicine services include, for example, diagnosis, monitoring, remote admissions and interventions. There are several variations for the actual process of telemedicine service, and it can be done for example with video conferencing or with real time electronic conversation with typed messages between the patient and the physician. The latter can incorporate also images. With telehealth, the scope is expanded beyond telemedicine and includes also other nonclinical services, like administrational meetings, preventative and promotive components and tele-education for patients and care providers. Telemedicine and telehealth may be also grouped under the term telecare, which refers to any kind of health care where remote support is incorporated (Gogia 2020: 12).

3.1 History of telemedicine

There have been restrictions with the availability of good health care long before the development of modern-day communication methods and the early stages of telehealth can be seen started with just sending and receiving simple written messages conveying information on symptoms and with treatment options. The discovery of electricity in the 19th century started the development of telecommunication and wired communication

helped the ideas of telehealth to emerge. The invention of the telephone helped the concept of telemedicine to evolve and, in 1905, a Dutch physiologist used the telephone for transmission and monitoring of cardiac sounds and rhythms. The term telemedicine was formally recognized in the 1920s when two-way television and audio signals were used for communication. The 1940s saw the first transmission of radiography through telephone circuits and the first use of telemedicine to transmit video, images and medical data occurred in the late 1950s and early 1960s. The need for telemedicine became clear in the 1960s, when the National Aeronautics and Space Administration (NASA) began planning for first manned space flights. Spacecrafts were equipped with telemedicine capabilities for monitoring purposes. This eventually followed other programs focusing on transmission of medical data, x-rays and for example heart and chest sounds. The main purpose for these early projects were to provide access to health care in rural areas and to deal with medical emergencies. Radiology became the first speciality to really adopt telemedicine in the 1980s and the remote utilization of Picture Archiving and Communication Systems (PACS) was a natural step. This enabled radiologists to examine and report images from any geographical locations. Telecardiology started to develop in 1975 when tele-transmission on ECGs (electrocardiograms) started to evolve. This wireless transmission of ECG images was used for interpreting cardiac abnormalities, but also for monitoring patients with pacemakers in geographically remote areas. The early stages of transition to the modern Internet in 1990s had a big impact on the development of telemedicine as the early systems started to require more bandwidth. Specialities that benefited first from this were the ones that used interpretations of audio, images or videos. Patient conversations and video conferences became a reality also during this developmental stage (Gogia 2020: 12-14).

3.1.1 The present and the future

As a part of digitalization of health care, telemedicine services are becoming more common in countries around the world and especially in many developed countries there already are well-established telehealth programs in play. Still the potential is yet to be fully utilized and it remains an ongoing process as most of the telemedicine programs are so large and complex undertakings with their system and legislation and data security requirements. Telemedicine would benefit from a single and unified Electronic Health Record (EHR), but currently this exist only in some of the smaller countries, where also the need for telemedicine services is smaller. This unified EHR is still yet the direction

for many countries in the future. Smartphones are continuing to have a major impact on public health in general and already in 2017 there were over 325 000 health apps available for download (Research2Guidance, 2017). Today mHealth solutions offer countless opportunities for patients to gather health data and health care professionals to provide their services. The development of mHealth will no doubt continue in the future and there are already software and hardware attachments available to even better the range of health data that can be gathered and transmitted forward with a smartphone and other mobile devices. The use of social media, email and other instant messaging and video services like WhatsApp, Skype and Slack are also part of the distribution and operations of telemedicine. Even though they too, and especially, have clear privacy and data security concerns (Gogia 2020: 16).

The future of Telemedicine looks bright and it will become a big part of health care systems around the world. Telemedicine services have benefited greatly and will continue to benefit from the digitalization of health care. Telemedicine and telehealth in general still have many issues and will not offer solutions for all. In developing countries there are availability and stability issues with ICT infrastructures and even the most advanced telemedicine service cannot offer solutions for the basic health concerns like water and sanitation and lack of food for example. Telemedicine still will and has already become a routine not just to provide better access to health services for remote locations but to care for the aging population around the world (Gogia 2020: 16-17).

3.2 Types of telemedicine distribution

There are several different kinds of situation where telemedicine can be utilized. A patient can be immobile or otherwise bed ridden, there can be a physical and geographical barrier that prevent access to care giver or there can be financial reasons to prefer remote care, like with patients with chronic diseases which require frequent visits. Or there may simply a case of having too few physicians in a specific area to provide the demanded level of care to every citizen. With these different kinds of scenarios there are also different types of methods which are most suitable for any specific case of care delivery. In many cases a hybrid model of many of the following methods are used.

1. **Real time / synchronous** methods provide live data transfer with for example a video conference session between a patient and a physician. Synchronous data transfers are used also for live viewing of ultrasounds, heart sounds etc.
2. **Store and forward (S&F) / asynchronous** methods are used for recording and transferring of data, whether it is images, text or for example video. Viewing and commenting of data can be done when it is convenient and there is also less dependency on constant connectivity.
3. With **telemonitoring or remote monitoring** medical devices record and process health data which can be then transmitted either real time or with S&F method.
4. **Mobile health** (mHealth) solutions provide inexpensive and flexible method either synchronously or asynchronously, depending on the case

(Gogia 2020: 17-18).

3.3 Ethical and regulatory guidelines of telemedicine

Healthcare as an industry is very regulated and monitored. On top of everything, telemedicine brings new set of requirements for the service providers, as it covers several activities with regulations, laws, different health systems, cultures, needs and approaches to ethics. And as there are a lot of variation especially with the legal and ethical issues between different countries, one unified approach to these matters is hard to achieve and for those countries lacking a more detailed guidelines, the World Medical Association's 2009 "Statement on Guiding Principles for the Use of Telehealth for the Provision of Health Care" can be used (Mars 2020: 297).

Medical ethics, defined as "moral principles that govern the practice of medicine" (Lexico, 2020) guides the physician in his/her work, but Telemedicine brings also several other issues on the table, that need to be addressed. When the service is not provided face-to-face, informed patient consent is required, patients must be reliably identified and there needs to be great emphasis on the security of data transferred between the physician and the patient and the patient records must be appropriately managed according to relevant legislation (Valvira, 2015). Then there are also the added challenges for the physicians to evaluate case by case whether the patient is suitable for telemedicine as an individual but also as a case. The doctor-patient relationship is one of the most vital parts of a medical care and it is based on trust and knowledge of the history and the

background of the patient. The lack, or at least change of this relationship, is seen as one of the major issues with telemedicine (Mars 2020: 298-299).

3.4 Technology mediated service interaction in telemedicine

As telemedicine services are, by their very definition, provided remotely, the interaction with the patient and the service provider conducted through technological means. Technology mediated interaction is commonly referred as interaction through computers and the internet, between two or more persons, that is based on voice, video, text and/or images (Sivunen, 2017). Service interaction, on the other hand, is simply put a transaction between a service provider and a customer. A service interaction can be divided into two types: a singular service encounter and a service relationship. In the context of health care, a singular service encounter could be, for example, an urgent visit to emergency room, that was not planned or reserved beforehand. A service relationship could be a yearly visit to a family physician. In a service relationship there is more emphasis on personalization and trust between the service provider and the customer. With singular service encounter, the link between the service provider and the customer is looser and the customer may interact with a different service provider with every new interaction. This model is designed to provide services to large number of customers in an efficient way (LeRouge, Garfield & Collins 2012: 623).

In addition to the service provider and the customer, there can be also a third actor in a service transaction, namely a service organization. The service organization provides the means for the service provider to serve their customers. These three are linked with each other in a service triangle. The strength of the connections within the service triangle is affected by the type of the service interaction between the actors and by the means of interaction. Technology emitted interaction changes the circumstances for the actors but also affects the linkages between the actors. As with telemedicine, the service interaction is technology mediated, there is a risk of making the process more complex for all actors as the distance between the actors is extended. Through technology mediated interaction, telemedicine brings changes to the communication process between the doctor and the patient and understanding and acknowledging this change is important not just for the doctor and the patient, but also for organizations planning and implementing telemedicine services in general (LeRouge, Garfield & Collins 2012: 623-624).

3.5 Doctors' adoption of telemedicine

Several forms of telemedicine are already common in several countries, at least as an add-on to traditional health care service delivery. But even as the benefits of telemedicine are clear, the doctors providing the service have just recently started to adopt telemedicine as a way to practice their profession, maybe somewhat reluctantly. Peer consultation is very common between doctors and new technology and informal social networks have made it much easier to get consultation and expert advice. Still adopting new, in some cases possibly unstable, technology to the day-to-day work is not a simple process and many doctors, with already very busy schedules, may not have enough incentives to even try telemedicine. Adopting the legal requirements and guidelines of telemedicine demands added work for also the doctor and this and the amount of data generated by telemedicine might get overwhelming for some. Reimbursement policies with telemedicine services also might cause challenges as there comes cases, where the patient can't be treated with the already opened telemedicine session. The patient cannot be invoiced without her/him getting a needed treatment and the doctor cannot invoice for the used time. Prescribing medicine to patients, that they don't see face-to-face at all, might also cause issues for some doctors (Saini & Jaiya 2020: 168-169).

The overall perceptions and attitudes towards remote care among doctors still plays a major role in the adoption of telemedicine. If the training for telemedicine is insufficient and telemedicine was not covered or taught in medical schools, doctors are hesitant to use telemedicine. There is the fear of litigation and overall worry for the quality of the care and security of sensitive patient information provided through telemedicine. Many doctors still have the mindset that examination of the patient is not sufficient if they are not able to touch the patient and they believe patients feel also that the doctor-patient interaction is inadequate without a physical examination, even though this might not be the case. Additional training programs for doctors but also for the patients are most likely needed in the future (Saini & Jaiya 2020: 170).

4 Medical training in Finland

The basic medical education in Finland lasts for 6 years and the scope of the education is minimum 360 ECTS credits (European Credit Transfer and Accumulation System). This degree programme in Medicine leads to the degree of Licentiate of Medicine, which

is the same as Medical Doctor or M.D (Doctor of Medicine) in Anglo-American countries. In Finland, the degree programme in Medicine is offered by five universities, Helsinki, Turku, Tampere, Oulu and Eastern Finland (Kuopio campus) (Lääkäriliitto, 2020).

Even though there are some differences with the degree programme between universities, the basic structure of the programme is the same. The first two to two and a half years is the pre-clinical phase, which concentrates mostly on the structure and functionality of the human body. After this theory-based phase, begins the clinical phase. In the clinical phase the students will concentrate to learn more about the skills needed in the practical work of a medical doctor, such as patient work, diagnosing illnesses, and providing health services in general. Parts of the clinical phase is done in various teaching hospitals and health stations for the purpose of learning the needed medical skills. After graduation, a medical doctor can work as a general practitioner for the rest of her/his career or continue with a speciality training, as many do, to focus on more specific are of medicine. The medical practice of a speciality training last generally from five to six years, and there are 50 different specialities a doctor studying in Finland can specialize in. In addition, doctors can complete a special qualification competence regarding a specific area of medicine (Lääkäriliitto, 2016).

Even though eHealth and telemedicine related topics might be a part of several courses within the degree programmes, based on the curriculums of the degree programme of Medicine from all five universities, only the university of Oulu had a dedicated course for eHealth. In Oulu students can choose the course ‘Basics in eHealth for medical students’, as a part of their elective studies. The learning outcome of this course is to learn how to define central ICT terms and solutions in the context of health care, to evaluate the societal and economical importance of ICT in health care and to understand the role of eHealth and telemedicine solutions as a part of health care. The course covers topics as remote consultations, mHealth, remote education and future visions of health care information systems (Weboodi, 2020).

5 Communities of practice (CoP)

Communities of practice (CoP) is a concept of learning through promoting knowledge transfer and sharing within an organization. The main concept is to learn and share knowledge through doing the same work together, with the overall goal of getting better

at it. Individuals in CoPs share a profession for example, and they have mutual interests and passions. Members learn from each other through sharing of information and experiences. CoPs can form organically when same minded people in an organization get together or they can be developed intentionally as strategic function. CoPs can operate physically to a same location, or they can function also virtually via mobile phones or teleconference tools. This kind of situated learning is about transferring knowledge and information between the learner and the teacher through active participation to the work and process itself. So plainly defined, situated learning in CoPs is a way of learning by doing. Learning is happening by becoming a part of an activity (Nicolini, Scarbrough & Gracheva 2016: 255-256).

As health care organizations consist of highly educated professionals, health care organizations have influenced a lot in the development CoPs, as health professionals recognize the importance of continuing professional development (health professionals maintaining and broadening their knowledge and skills in practice) (Ho et al. 2010). As these professionals many have their own special area of expertise, communication and social interaction between these professionals is beneficial for example for the quality of care and for the improvement of services. These professionals can learn from each other's area of expertise even though they are specialized in some other area. This enables more overall treatment of patients. CoPs can produce immediate value from the results, but they can produce also other potential value on subjects arising during the work. But there are challenges for the CoPs as well. As medical communities are very hierarchical, it is not always a given, that all members of the CoP will be treated as equal members. There are boundaries between different groups of health care practitioners and therefore CoPs are not always working as planned. Problems with CoPs are usually happening in structural or individual level. As the forming of the groups may have its own challenges there are other structural factors that are affecting the operation of CoPs. Especially in a larger health care organization it may be challenging to form a systematic way for the CoPs to operate. There can be restrictions from the organization and to get all the different clinicians and professionals to meet and work according to predetermined plan and regular timetable can be difficult. Sharing of information and data especially over organizational borders can be regulated. And to get all the members to commit their time and effort to it, can be also challenging. The individual factors that may arise with CoPs are related for example to trust issues. Trust between the members is vital. Lack of trust between the individuals usually results in lack of communication and specialist in

several areas of expertise may end up in conflict situations as different areas of health care are clashing. There are strong identities and communities with every special area of health and with this there is a strong possibility of conflictions (Nicolini, Scarbrough & Gracheva 2016: 271-272).

5.1 Electronic Communities of Practice (eCoP)

With the development and use of modern information technology, the virtual CoPs, or electronic communities of practice (eCoPs) can also be utilized to promote intra- and interprofessional continuing professional development (CDP). These eCoPs offer temporal and geographical flexibility, that can address some of the possible challenges and issues that may occur, when forming a CoP. Information technology provides the means for communication between members of the CoP with different geographical locations and different time zones. Different kinds of videoconferencing tools, discussion boards and chat rooms, that offer a synchronous exchange of messages, provide a flexible and easy to set up way for communication. For medical professionals eCoPs can offer dynamic and continuous learning environment with fast access to wide range of knowledge and expertise, access to previous discussions on a specific subject and generally a platform for discussions and exchange of ideas for the purpose of optimal care of patients. ECoPs can be utilized also as a channel for a moderator or a supervisor of a specific team or a group to give operational instructions and guidelines (Ho et al. 2010).

For eCoP to be successful, it requires that the protocol for the communication (social network platform for example) is user friendly and that it covers all the requirements for data privacy. There should be a facilitator who ensures opportunities for all the members to interact with the community and learn. The facilitator has also a role of filtering the discussions, if needed. Ho et al. (2010:141) suggest also other guidelines for enabling successful eCoP. CoP should be voluntary and self-organized and even though the CoP membership might be assigned, the interaction and engagement should be self-directed, which encourages creativity. There should be a problem focused approach with an eCoP, as the eCoP offers flexibility of wider engagement of the members as the members can contribute when they want, regardless of geographical restrictions. An eCoP requires distributed and emergent leadership. This is important as the issues being addressed by health care organizations tend to be complex and multi-dimensional, especially regarding change initiatives, like the adaptation of new innovations or technology

of service delivery development (Sergi, Comeau-Vallée, Lusiani, Denis & Langley 2016: 210). A leader needs to encourage but also lead other members to freely experiment and contribute to the development of operations connected to the community. The electronic platforms for the communication of the eCoP should be easily accessible and available whenever the members want to interact with the community and the firewall and software should be arranged so that this is possible. Successful eCoP requires also mutual respect between the community members and it recognizes the importance of every member for the sake of interprofessional collaboration. Shared identity among peers requires trust, especially when the interaction is done mainly with electronic platforms. Members who are less interested in social hierarchies between disciplines or for example seniority are more suitable for eCoPs (Ho et al. 2010).

The research

6 Purpose, aim and research objectives

The digitalization of health care is happening and will continue to evolve even more in the future. Despite any possible personal opinions about it, this will affect the way medical doctors and other health care professionals will conduct their work in the future as well. One of the aims of this thesis is to research what are the perceptions and attitudes of medical doctors in Finland towards telemedicine. Then this thesis will focus more specifically to one form of telemedicine, namely online chat doctor services. The focus is mainly on the work of the physician through this platform and the aim of this thesis is to learn about the special characteristics of providing health care services this way, but also to research this form of telemedicine more in-depth. Even though working through different kinds of telemedicine platforms requires also technical knowledge and skills from the physicians, this is not addressed in this research with detail, as this thesis focuses more on the characteristics of the clinical work done remotely.

Based on the perceptions and experiences of the medical doctors, the aims and purpose for this thesis were narrowed down to the following research questions:

1. What is the perceived value and benefits of a chat doctor telemedicine service?
2. What are the perceived shortcomings and possible risks of a chat doctor telemedicine service?

3. What are the perceived skills and attributes that a medical doctor should possess, to provide an efficient and safe and of good quality medical services through a chat doctor service platform?
4. What are currently the general perceptions and attitudes towards telemedicine among the community of physicians in Finland?

7 Implementation of the research

This research was constructed as a case study and it was done in cooperation with Mehiläinen. Physicians already working with the Digital Clinic service provided the main data for the part of the research on experiences and perceptions on the work of a chat doctor. In addition, the research has another part, that examines medical doctors' overall attitudes towards telemedicine services and the digitalization of health care. All the physicians, that have participated in the research parts of this thesis, are working in Finland in several different sectors and specialities or studying medicine in one of the five universities in Finland, that offer the degree programme in medicine.

7.1 Case Study

Case study research is used to examine several features within small amount of specific cases, cases like individuals, groups, organizations or events. Data on the cases are detailed and extensive and case studies investigate one or small set of cases, focusing on details and context, within one period or multiple periods of time. So, case studies investigate details on internal features on each case but also the surrounding factors of the case. Case study research enables familiarization of a specific case with in-depth detail and the creation of new theory around it. Case study research is often qualitative in nature but can also use quantitative approach (Neuman 2014: 42).

7.2 Mehiläinen

Mehiläinen is a well-known and one of the biggest private providers of health care and social services in Finland. Mehiläinen provides services for over 1,3 million customers annually at over 500 locations and employs over 21800 employees from many fields of health care sector. The mission of Mehiläinen is simply to improve the health and well-

being of the population of Finland. Efforts towards this mission are done in cooperation with the public sector and the many companies and organizations in Finland offering occupational health services through Mehiläinen. Wide range of Mehiläinen's services are distributed on several sectors:

Private health care services:

- Physician services
- Diagnostics
- Operations
- Working life services
- Dental care

Public health care services:

- Outsourced services
- Health centres
- Public dental care
- Home care services
- Emergency care services and doctor/nurse staffing

Public social care services:

- Elderly care services
- Care services for the disabled
- Mental health services
- Child welfare services
- Non-institutional services

(Mehiläinen, 2020)

7.3 OmaMehiläinen and the Digital Clinic

Mehiläinen´s Digital Clinic is an online, telemedicine service that can be accessed through the OmaMehiläinen paltform. OmaMehiläinen and Mehiläinen Digital Clinic are available for private health care and occupational health care customers but also for some of Mehiläinen's municipality customers. Mostly these "doctor-on-demand" services are used via applications for mobile phones and tablets. The Digital Clinic operates on a platform designed and engineered by Mehiläinen and it is connected to a specific electronic medical record (EMR). The OmaMehiläinen online service offers for example the following services:

- Health and appointment data (for the whole family with family profile)
- Examination results (including medical images)
- Statements for examinations and prescriptions
- Occupational health care data
- Vaccination data
- Renewal of prescriptions
- Appointments and call-back requests
- Digital Clinic service 24/7

The Digital Clinic service is a telemedicine service which offers health care service 24/7 regardless of geographical location. The service is available via mobile device and provides a general practitioner on call. The service is conducted mainly by chat. Physicians respond daily between 7 a.m. and 11 p.m., nurse in the night-time between 11 p.m. and 7 a.m. There is a guarantee for the customers, that they will get a reply from a medical professional through the service within an hour. The remote consultation of a Digital Clinic physician is appropriate for example to following situations:

- Mild infections of the upper respiratory tract, urinary tract and gastrointestinal tract (good general condition, duration of symptoms a few days)
- Rashes and changes in the skin
- Allergy symptoms
- Acute back pain without alarming signals
- Symptoms with eye infections
- Renewal of prescriptions

- Follow-up appointment with the same physician

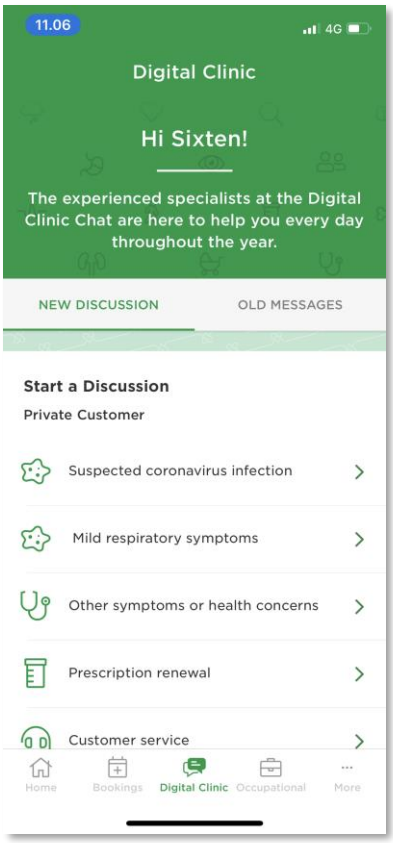

Figure 1: The opening window of Mehiläinen Digital Clinic mobile application. (Mehiläinen, 2020)

Situations in which the patients are referred to a face-to-face consultation are for example:

- Where a physical examination is required
- Trauma
- Symptoms in the limbs
- Neurological symptoms

The Digital clinic utilizes also symptom assessment in the beginning of a new session. The patient can start the discussion with the physician either with text and images or they can choose a suitable symptom from a list of most common symptoms and then continue with a predefined list of follow-up questions relating to the initially chosen symptom.

These symptoms include for example headache, back pain, rashes or other skin changes or urinary tract infection symptoms (women). This makes the process faster for both the patient and the physician as the reason for the “visit” is already somewhat known.

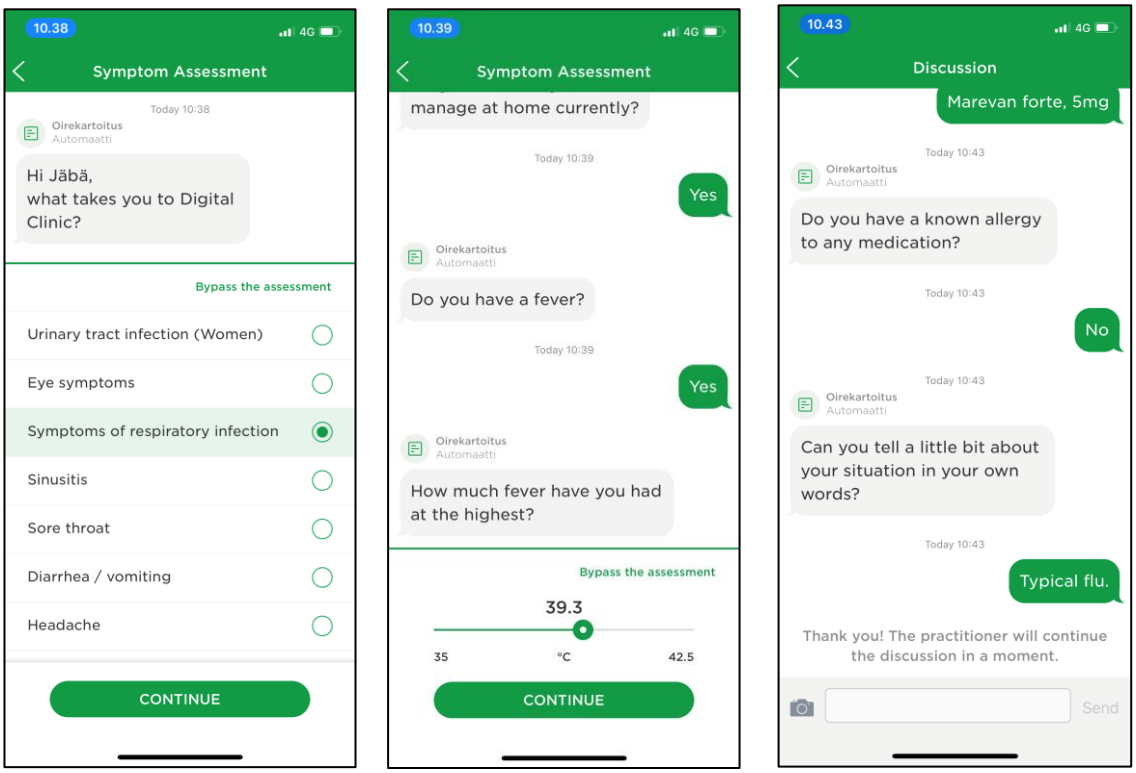

Figure 2: Digital Clinic symptom survey in the beginning of a new session (Mehiläinen, 2020)

7.4 Research methodology

Based on the purpose and the main research questions of this thesis, a qualitative research method was chosen as the main approach. The goal for qualitative research is to describe actual life and is often the chosen method to be used to gather data on attitudes and experiences on a chosen topic through interviews for example (Dawson 2002: 12). As one of the main research objectives of this thesis is to get more insight on the experiences and beliefs on telemedicine from human activities, qualitative data, which records qualities and is usually expressed in words, is needed (Walliman 2018: 79). However, with research particularly about human beings, a combination of qualitative and quantitative data examination can often be utilized. Quantitative research generates statistics from a larger focus group with methods like surveys and questionnaires. Quantitative data is measurable and usually expressed in numbers. Many types of data can be seen

from both qualitative and quantitative perspective and with appropriate analytical methods a combination of both can add value to the research. When examining the main research questions of this thesis, a combination of both research methods seems to offer the most versatile and efficient approach for best results. For example, to gather information and to really understand the overall attitudes towards telemedicine among doctor community in Finland, relying only on the qualitative data gathered from doctors that already have adopted telemedicine, may not give the most objective results. Because of this, instead of focusing only on qualitative research, the research methodology for this thesis was chosen to be a mixed method approach (Walliman 2018: 79-81).

For this thesis and for the purpose of the mixed method methodology approach, both qualitative and quantitative data have been collected. Mixed method offers better opportunity to explore the subject and to complement the strengths and to overcome possible weaknesses of a single methodology approach. The balance of data between qualitative and quantitative in this thesis is qualitative dominant and the strategy for using all the data was concurrent nested, where the qualitative approach was given priority and the quantitative approach was then embedded, so specific questions could be answered more thoroughly (Walliman 2018: 169-173).

7.5 The qualitative research

The qualitative research part for this thesis was conducted by interviewing medical doctors, who have previous experience from clinical work through telemedicine, mainly from the Mehiläinen Digital Clinic service platform. The average age of the interviewees was 41 and median 35,5, youngest being 32 and the oldest 58 years old. For the basis of the interviews a set of 10 questions was designed to give structure for the interviews. These 10 questions (appendix 2) were designed to go through the background of the interviewee, their experiences from telemedicine, their opinions and perceptions of clinical work done remotely and their observations on which different specialities might be best suited for telemedicine. All the interviews were done in Finnish and then the relevant sections for this thesis translated to English.

7.5.1 Sampling

For the benefit of the qualitative research, participants chosen for the interviews should represent the best possible knowledge on the context of the research phenomenon and because of this, a purposive sampling technique was used (Kananen 2008: 75-76). The presentation of the research project and the request to participate to the interviews were sent to 37 medical doctors working with Mehiläinen Digital Clinic. From these 37 doctors, 13 were still contacted individually because of their background and experience on the subject and they agreed to be interviewed for the qualitative research part of this thesis as they represented the more experienced side of the Digital Clinic pool of doctors. In addition to these 13 doctors, one other was asked to participate to the process. Most of the interviewed doctors (appendix 1) were general practitioners, but there was also a psychiatrist, a paediatrician, a general surgeon and two specialists focused on general medicine that took part to the process and gave their insights. From the 14 doctors, 13 were working through the Mehiläinen Digital Clinic using text and images with the chat connection as a way of communication with their patients. The only one not working with the Digital Clinic was the psychiatrist, who was using video conferencing as a mean to treat patients. In addition, there was also one other doctor from the 13 doctors, who was treating patients with video conferencing tools in addition to the Digital Clinic chat.

7.5.2 Data collection

The first contact towards the doctors were made via email in 15th of May in 2019. The research project was first introduced then and the request was made to find willing participants to the interview process. After this the 14 doctors that took part to the interviews were selected and the interviews were conducted between the timeline of May 29th, 2019 to March 3rd, 2020. Two of the interviews were done by sending the interview question survey by email to the recipients. The survey followed the same structure of the 10 questions that were used also for the live interviews. One interview was done as a face-to-face interview, 11 interviews were completed as phone interviews and 2 through written questions and answers. The length of the interviews varied between 15 minutes and 36 seconds to 41 minutes and 48 seconds. The face-to-face interview and all the phone interviews, talked through a speaker, were recorded using an Apple iPad tablet and the built in Voice Memos application. Permission for recording the conversations were acquired at the beginning of each interview. Transcribing of the interviews was done as the

final step of the interview process by listening the iPad recordings step-by-step and writing them down to a Microsoft Word document.

7.6 The quantitative research

For the quantitative part of this thesis process a questionnaire was prepared. The purpose of this part of the research was to gather more information on the overall perceptions and attitudes towards telemedicine and the digitalization of health care among medical doctors and medical students currently working and studying in Finland. The goal for this quantitative part was to get participation and input to the research from both the public and the private sector and especially also from doctors without previous experiences of telemedicine work. The questionnaire (appendix 3) was constructed from 12 questions and all the questions gave the option for answering with the scale of one to three, or one to five depending on how each question correlated with the opinions of each participant. The questionnaire was sent to the participants at September 2nd, 2019 and they had until September 30th to participate to the process and submit their answers.

7.6.1 Sampling

For the questionnaire of this thesis, database of medical doctors from Mehiläinen was utilized. All the contact information of the database, namely email addresses, were collected according to the General Data Protection Regulation (GDPR) and all the doctors on the contact list had given the permission to be contacted by representative of Mehiläinen. Ultimately the questionnaire was sent to 8717 doctors and after filtering the incorrect addresses or the ones having technical issues, 8375 were successfully delivered to the recipients. These participants were all either graduated medical doctors or medical students working or studying in Finland. Most of them were Finnish and graduated from one of the five universities that offer medical degree programmes in Finland. There were also medical doctors of foreign descent with medical education background also from other countries but working now as a licenced doctor in Finland. The number of participants with foreign background is unsure but based on the list of contacts, who received the invitation to the questionnaire, it was small. Out of the 8375 recipients, in the end 435 (5,19%) participated to the questionnaire.

7.6.2 Data collection

The whole questionnaire was sent and processed with Questback software. Questback offers a wide range of solutions for different kind of market researches for the purpose of gathering feedback (Questback, 2020). The list of email addresses was transported from Excel to Questback and the questionnaire was designed directly in the Questback editor and then sent to the participants. Questback also scaled the questionnaire for mobile devices, so all the participants could answer the list of questions with their mobile phone or tablet. All the data from the answers was gathered to Questback and from there they could be processed and viewed using different filters to include or exclude a specific group of participants for example. All the results were then exported to Microsoft Word, Excel and Powerpoint formats for further analysis.

7.7 The Slack channel

Mehiläinen´s Digital Clinic operates on its own platform but the community of professionals, from different areas of expertise working with the Digital Clinic, utilizes also Slack in their day-to-day work. Slack is an instant messaging platform, developed by Slack Technologies. Slack enables for example work communities to send and receive text, images and videos in real time. Communities can establish different channels for different subjects and the channels can be divided to relevant groups, teams, projects etc. For Mehiläinen Digital Clinic, Slack is utilized in many ways. In addition of functioning as a virtual break room for informal interaction between the medical doctors and other teams, it is very efficient channel for peer consultation and for distributing information on matters like rota planning and other current matters regarding their operations. The Slack channel is utilized also in developing of Digital Clinic and because also the software development teams are a part of the Slack community, it offers an efficient and fast way of exchanging ideas on constantly making Digital Clinic better for the doctors using the platform and ultimately for the customers using this telemedicine service. For the purpose of this thesis, access to this Slack group was made possible to be used for informing the medical doctors about the research and the interview processes, but also to gather observational data (Slack, 2020).

7.8 Data analysis

All the collected qualitative data for this thesis was analysed using a thematic content analysis method with an inductive approach. The objective for thematic analysis is to identify, analyse and report patterns (themes) within the collected data. As thematic analysis is not bound to any specific theoretical perspective, it is suitable for the purpose of reporting experiences, meanings and the reality of the participants. The medical doctors of the Digital Clinic in this research. As the used data was collected specifically for this research, it meant an inductive approach, which is driven by the data itself. The data set for the analysis was compiled from data items (the conducted interviews) and from these data items, individual chunks of data, or data extracts, were identified, which represented the most relevant data for the purpose of this research (Braun & Clarke 2006: 6-12).

The data analysis process was conducted in six-phase framework, suggested by Braun & Clarke (2006: 16). The following table (figure 3) describes these six phases and goes through more in detail, what was done in each phase. Even though the analysis process was begun chronologically from one phase to the next, in the end the process moved back and forth between these six phases throughout the duration of the whole analysis phase.

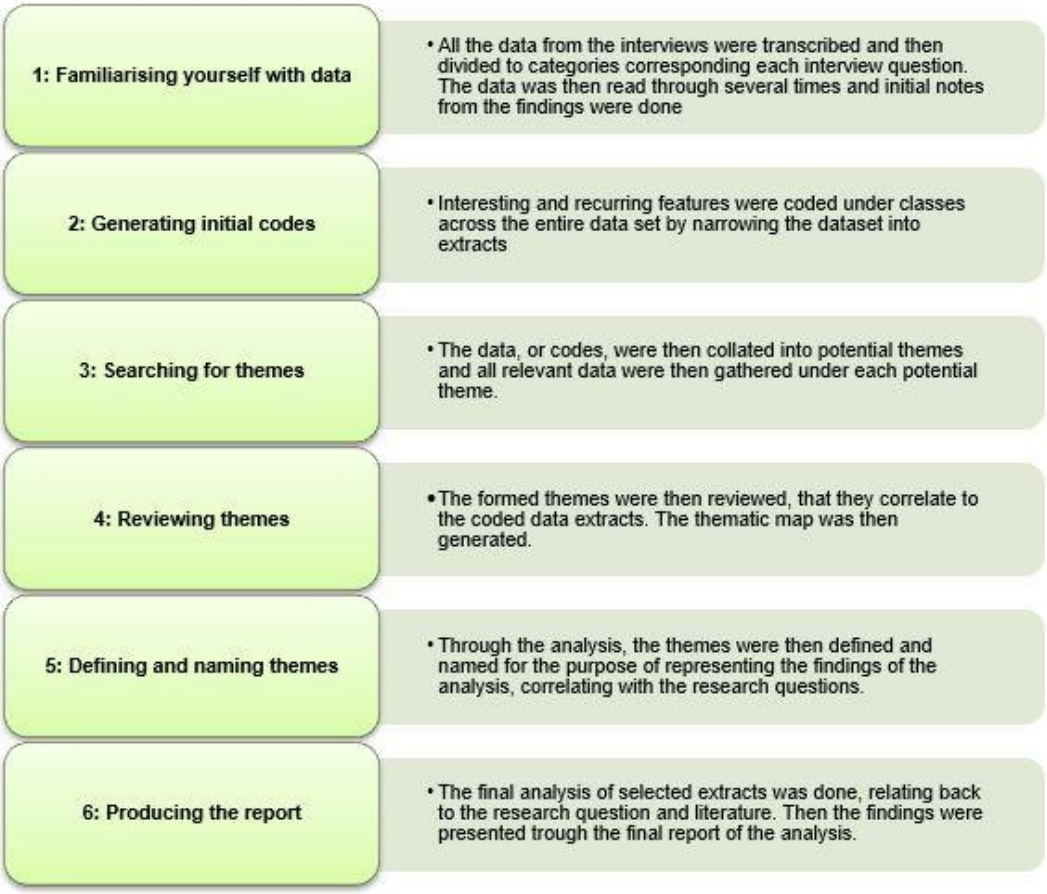

Figure 3: Thematic Analysis phases. (Braun & Clarke 2006: 16-23)

In the process of coding the data and identifying the data extracts that resulted in the forming of the themes, there were specific data that were recurring between the data collected from the different interviews. It became apparent that 14 interviews were a sufficient number of interviews to reach adequacy for collected data to reach data saturation, as described by Neuman (2014: 478).

As the emphasis of the research in this case study was in the qualitative research, the quantitative data was used to corroborate and strengthen the findings of the qualitative research, where appropriate and relevant. In the other hand, in some parts of the results, the quantitative research results were used to exhibit differences or possible contradictions between the results from both qualitative and quantitative researches. The results from the quantitative research were utilized as a whole and in some parts of the results filtered, exhibiting for example the results from a specific group within the participants, for objectivity and relevancy.

8 Results, section 1

In response to the research questions, the first section of the results, regarding this case study, focuses on the overall perceptions, interests and attitudes toward telemedicine among the community of medical doctors in Finland. The data analysed in this section was gathered from both the quantitative and qualitative research phases.

8.1 General perceptions and attitudes towards telemedicine

The total of 435 participants took part in the questionnaire for the quantitative part of this case study. Out of these 435 participants, 9,0% were medical students (mainly 5th or 6th year students), 50,8% were Licentiate of Medicine and 40,2% had a specialist training of some sort on top of the Licentiate degree. From those who already were working as a physician (n = 423), 48.5% were working in the public sector, 24% were working in the private sectors, 22,5% were working for both public and private sector and 5% for other sector. 73,2% of the participants had no previous experience from telemedicine as a service provider. 26,2% had previous experiences treating patients through telemedicine services, but the form of telemedicine service was not identified. The age distribution among the participants is illustrated with figure 4.

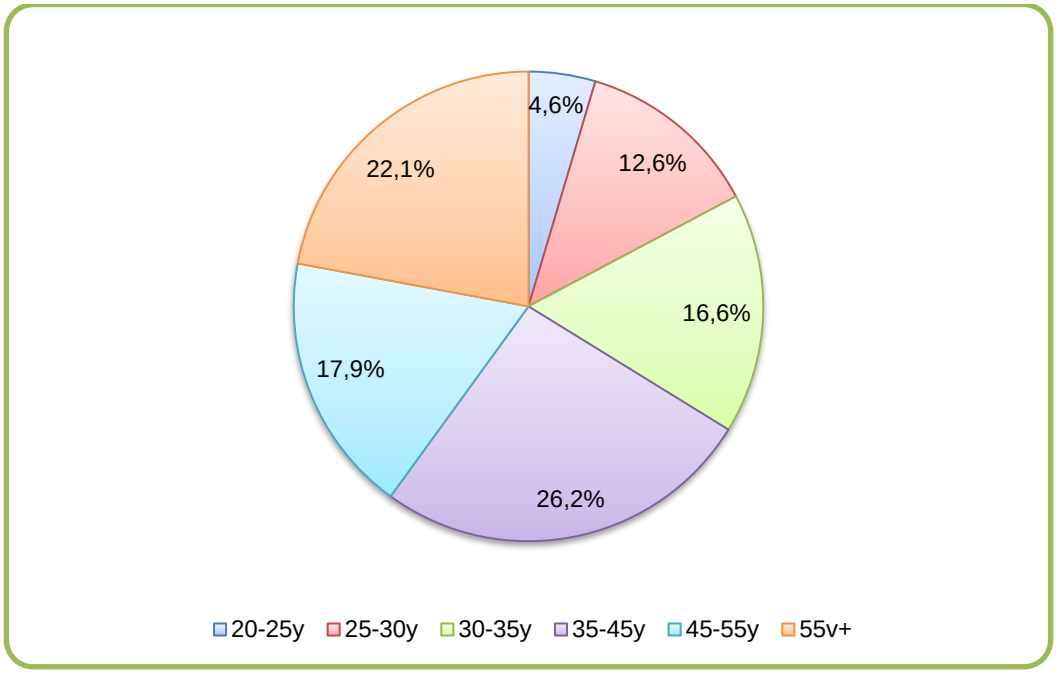

Figure 4: Age distribution of the questionnaire participants.

One of the main goals for the questionnaire was to gather information and get insight on how telemedicine is perceived among medical doctors in comparison with a traditional way of treating patients. Also, what was covered, was the overall interest towards telemedicine as a way of practicing medicine. There was no clear definition of the form of telemedicine in the questionnaire, but rather covered the subject as a way for medical doctors to treat patients remotely, regardless of the method. Interest and motivation to try telemedicine work was inquired from the 73,2% of the participants (n = 319), who did not have previous experiences from telemedicine as a service provider, with the question:

> *If you do not have previous experience on providing telemedicine services, on a scale of 1 to 5, how interested you are to try telemedicine as a method to provide health services to your patients? (1 = not interested at all, 2 = somewhat interested, 3 = undecided, 4 = interested, 5 = very interested)*

The results from this part of the questionnaire, with answers from 319 participants, are illustrated with figure 5.

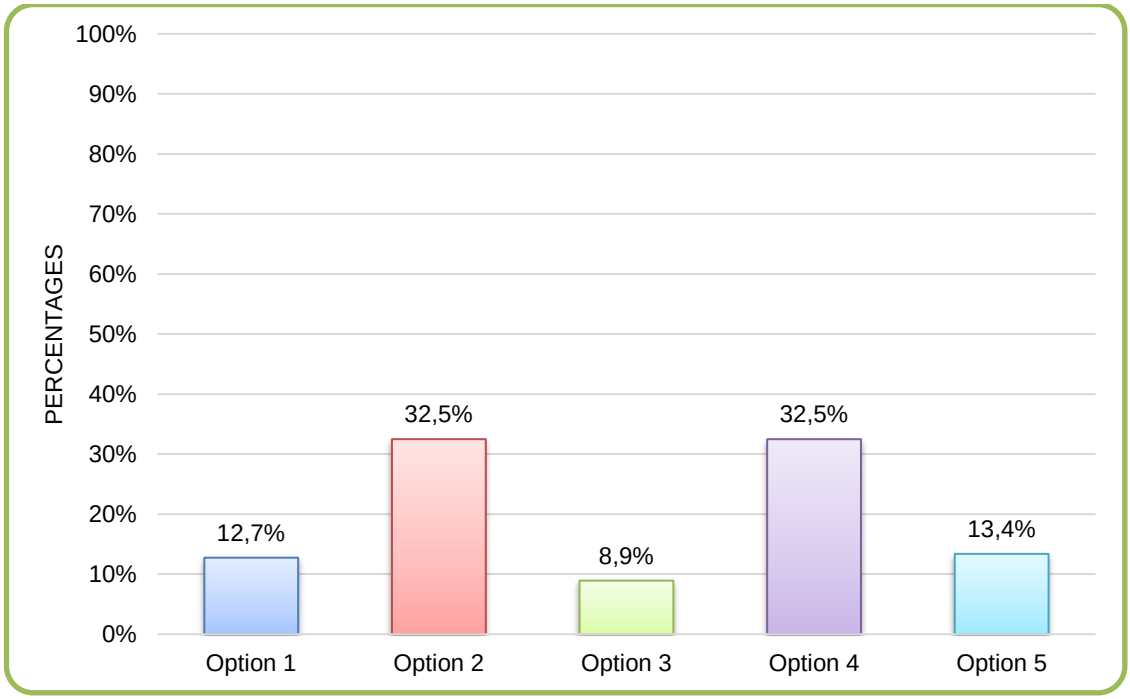

Figure 5: Interest to try telemedicine as a way of treating patients (participants without previous experience from telemedicine work)

Results from this part of the questionnaire are quite evenly divided to those interested and to those less interested as 45,9% out of the total amount of 319 participants were interested or very interested to try telemedicine work and 45,2% only somewhat interested or not at all. Again, without a clear definition of the form of method. Regarding to the perceptions towards the subject, all the participants were asked the following question:

> *Based on your overall observations, how is the practice of telemedicine perceived among the Finnish medical community as a viable way of practicing medicine alongside with traditional way of working? (1 = telemedicine is not a reliable option at all, 2 = telemedicine might work in some cases, 3 = undecided, 4 = telemedicine is a viable option, 5 = in cases where telemedicine can be utilized, it is just as viable option as a traditional way of working)*

The results from this part of the questionnaire, with answers from all 435 participants, are illustrated with figure 6.

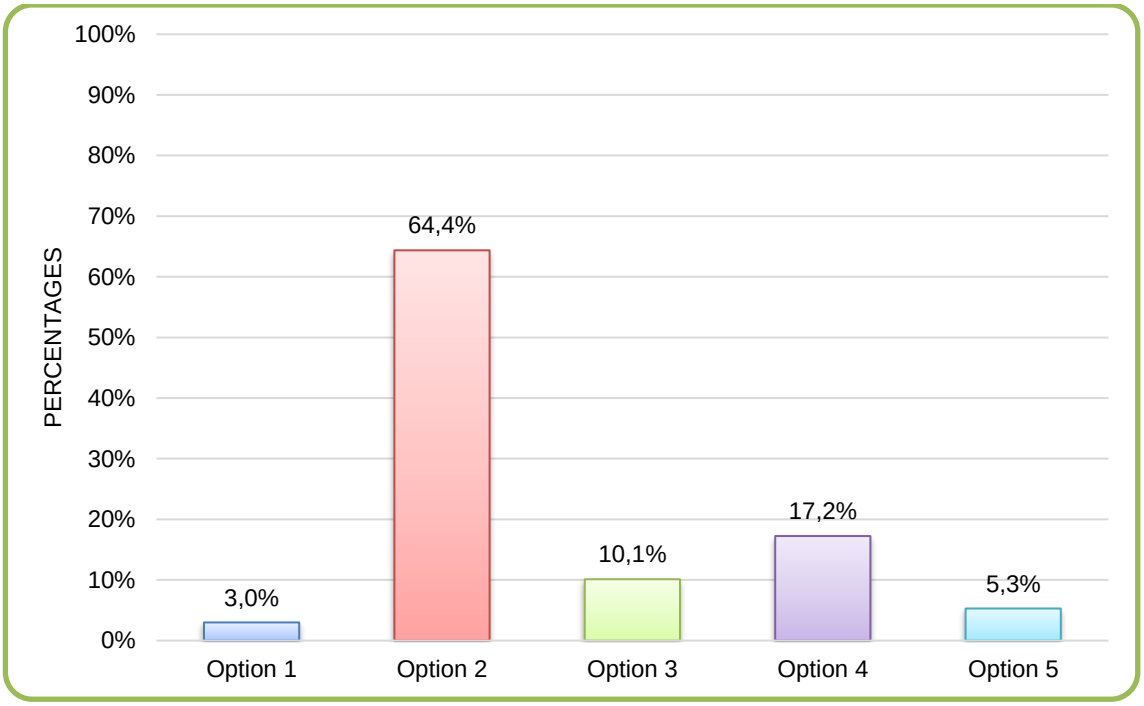

Figure 6: Perceptions and attitudes towards telemedicine as a way of practicing medicine (all the participants)

Even though there is a quite big interest to telemedicine as a way of working, clear majority of 64,4% of the participants seem to relate to telemedicine work quite sceptically and saw that telemedicine *might* work in some cases and only 22,5% of the total participants saw it as a viable way of practicing medicine, in those cases where face-to-face contact between the patient and the physician was not mandatory.

The subject of perceptions toward telemedicine was covered also with the interviews in the qualitative part of the research. The interviewees were all asked the following question as a part of their interview:

> *Based on your overall observations and experiences, how is the practice of telemedicine perceived among the community of physicians in Finland currently?*

There were similarities in the answers between the results from the questionnaire and the interviews and the physicians working with the Digital Clinic told that other colleagues, who don't have any experience from telemedicine, were very keen to hear about the experiences from telemedicine work. Still, based on the interviews, attitudes and perceptions towards telemedicine among medical doctors in Finland are still quite cautious. Many of the interviewees said the they still encounter a lot of scepticism when they mention to other colleagues, what kind of work they do. The unexperienced colleagues raise the questions of possible risks of medical malpractice, prescription of medicine without properly going through the background of the patient and that there will be compromises made on the quality of treatments. Nevertheless, the interest in telemedicine was clear and it is getting more acceptable as a part of modern medicine and based on the interviews, getting the first own experience of telemedicine work is vital to change attitudes toward positive and more acceptable. As it was mentioned in some of the interviews:

> *"those who are not familiar with it at all are opposed to it and believe that face-to-face contact is needed. Those who are familiar with the subject, and who have come to know it, understand that both are just as viable way of practice medicine"*

> *"doctors who have not done telemedicine work are critical and think it causes reckless description of antibiotics etc. However, there are fewer*

suspicions than before. Yes, attitudes are clearly more positive nowadays. And that's probably because more and more of these digital services are in use and doctors are being able to test them themselves"

The importance of first-hand experience from telemedicine work was inspected with the qualitative data. The results from the questionnaire was filtered to show the answers only form those participants (n = 116) who had previous experiences from telemedicine service delivery. Comparing to the results in figure 6 with answers from the total sum of participants, the difference in results, illustrated in figure 7, were surprisingly small. There was an increase of only 7,3% for the answer options 4 and 5 combined, when the participants had previous experience from telemedicine.

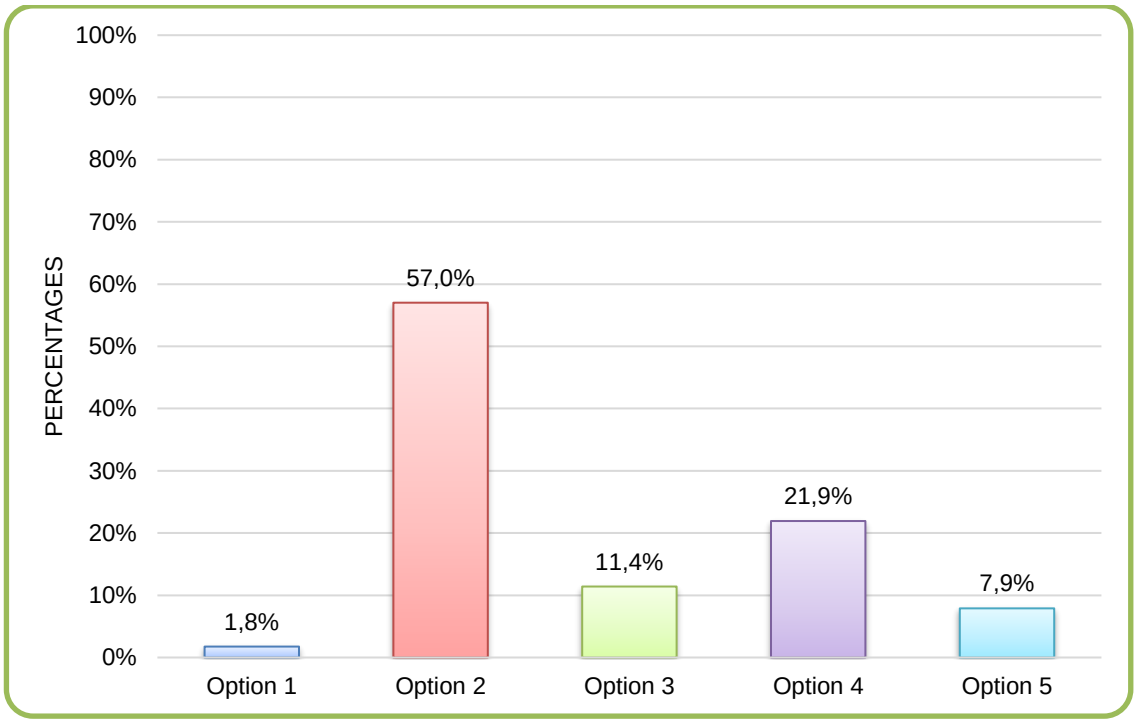

Figure 7: Perceptions and attitudes towards telemedicine as a way of practicing medicine (only participants with previous experience from telemedicine service delivery)

9 Results, section 2

The thematic analysis was done using the data gathered in the qualitative research phase. The process of thematic analysis resulted ultimately in three themes with six sub-themes to give the final themes depicted in the final theme map (figure 8).

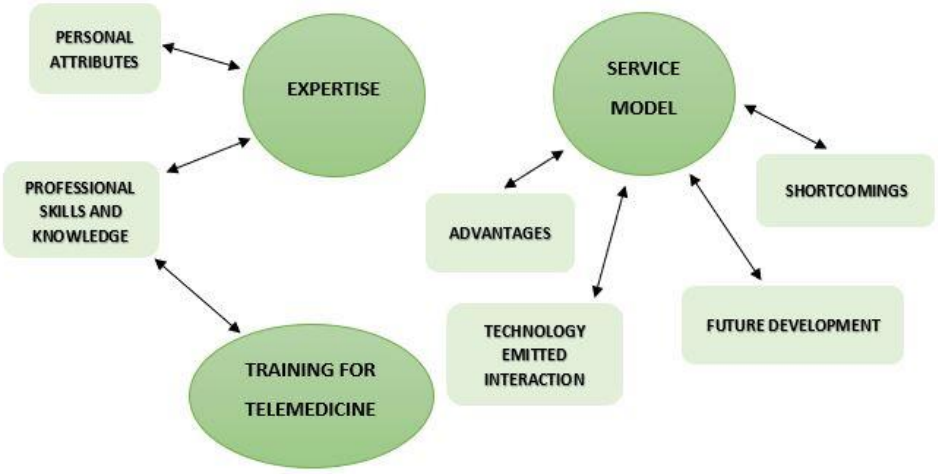

Figure 8: Final theme map.

9.1 Theme: Service model

This theme was a clear main theme that emerged from the data gathered in the qualitative phase. Basically, all the interview questions were designed to gather data on the experiences, perceptions and opinions of the medical doctors, relating to working and treating patients remotely through the Digital Clinic. This data could be then divided into four sub themes. This theme represents in a more detailed way, what kind of features does the Digital Clinic service model offer. What are the pros and what are the cons, now and in the future?

9.1.1 Sub theme: Advantages and suitable specialities

When talking about the benefits of this kind of chat doctor service model, these benefits can and should be investigated from several points of view. Referring to the service triangle, benefits can be identified at least in the case of the patient, the medical doctor and the organization providing the means for the service. In addition, when talking about

health care, there are also the societal benefits to consider. As the focus of this research is on the perspective of the medical doctor, these results will focus mainly on the that.

Digitalization and the development of information and communication technology have increased the possibility of remote work in many different professions. As the results from the questionnaire and the interviews indicated, medical doctors are also interested working remotely and this was one of the main benefits for the doctors in the interviews as well. For most of the interviewees the option to work from home or other desired location was the main motivation to initially try telemedicine. Most of the doctors working with the Digital Clinic are solo practitioners, so the option to work remotely brings flexibility to organize one's work. Several interviewees pointed out, that they started to work with Digital Clinic initially during maternity leave and for one other it was during a longer sick leave after a leg surgery. For solo practitioners and entrepreneurs, whose income relies on invoicing from own services, this was big factor. On top of bringing flexibility in those situations, where it is not possible to work physically at the workplace, the option of remote work was also seen as a very helpful tool to organize and manage work with one`s private life.

> *"nowadays all the work I do, I do as an entrepreneur. It means that it is a kind of a puzzle for yourself to plan your work. I work here, there and everywhere and it was an insanely good addition for organizing everything"*

> *"Flexibility in it and a new way of doing your work got me into it. That your work is not tied to a specific place. Organizing your private life and work is easier. Family life and work and other life situations"*

There were also several comments made about the overall stress, load and demands that a medical doctor must endure in their line of work and how they feel that they can manage this better and even be more efficient working remotely:

> *"I felt that 5 full days of eight hours of normal reception work every week all the time is very exhausting. Adding also Digital Clinic shifts to the week helped manage the load better"*

> *"it is very stressful for a doctor and the days are long and the flexibility at work can be really bad at times. Here, however, I think all of them came together. Work is flexible and can be done more efficiently. I myself feel that I may be able to work more efficiently than it would be on a normal reception"*

There were several cases brought up with the interviews regarding advantages from this kind of service model, that can be viewed as a gain for the medical doctor but also for the patient and in a larger scale for the society as well. Many interviewees experienced that when taking the interaction of a medical doctor and a patient to a remote channel, this lowers the threshold for the patient to bring up also more sensitive matters that might be bothering them. When the interaction can be done more anonymously without a face-to-face contact, patients are more straightforward and less intimidated to talk about their worries. This was seen as a very positive thing as the doctor was able to treat immediately the right symptoms and the patient got proper treatment faster. This efficiency came up as a clear advantage for the service model as well. Length of a normal shift from most of the doctors working with the Digital Clinic was 4 hours. The amount of patients treated varied quite a lot depending for example from the experience level of the treating physician, but for most of the interviewees the amount of patients treated was between 30-60 patients in a 4-hour shift, including also prescription renewals. Several interviewees brought up their opinions about the possibilities this kind of service model could have also for the public sector:

> *"I personally see that this could be the solution to many situations where there are a lot of these shortages of physicians in the municipalities. These kinds of solutions could bring a lot of value"*

But in which kind of situations this kind of treatment of patients, that is solely based on text and images, is suitable for? Based on the results from the interviews, this kind of model is best suited for straightforward and acute cases in the level of general medicine, that don't require a physical examination of the patient. Some of the cases that were brought up in all the interviews were:

- Basic infections that can me mostly treated based on the information of symptom survey, like urinary tract infections of women for example

- Problems of the skin, which mostly all can be treated based on an image and the description of the patient. Like allergic reactions of the skin and pre-stages of a Lyme disease caused by a tick bite for example
- Symptoms of respiratory infection and other flu-like symptoms
- Prescription renewals
- General medicine level of eye infections, that can be diagnosed based just on an image
- Erectile dysfunctions
- General health counselling

9.1.2 Sub theme: Shortcomings, risks and unsuitable specialities

As this case study examines a service model, which is still relatively new, the shortcomings and possible risks were also discussed with the interviews. As the nature of working remotely excludes the possibility of physical examination of the patient, this naturally changes the process. This brings a different perspective to the work of a doctor, as all the non-verbal communication is missing. There are fewer signals for the physician to monitor and to draw from. This affects to the diagnosis of the patient as some of the basic senses of the doctor cannot be utilized. As it was brought up during the interviews:

> *"during a face-to-face reception, physician examines the patient more and follows also gestures and other non-verbal communication. This is not possible with this chat clinic"*

> *"one sensory evaluation, that is, the sense of smell, is missing"*

The comment made about the sense of smelling missing referred to monitoring for example if the patient is under the influence of alcohol or cannabis.

Several interviewees brought up also their experiences on the patient's behaviour, which ultimately affects the work of the doctor. As mostly the experiences from the patients' opinions on the service model were positive and the fastness and easiness of the service was greatly appreciated, there were observations made also that patients could be more aggressive with remote reception, when comparing to normal face-to-face situation. Patients had more courage to say back to the doctor and express their discontent, if they

were not able to get a treatment to their issues through the Digital Clinic. Regarding situations and cases where the service model of the chat doctor service is not suitable, the following were brought up:

- All the cases that ultimately require a physical examination, like orthopaedical cases that require closer examination of movement, ear, nose and throat (ENT) issues (except some infections), gynaecologic cases, surgery etc.
- Unclear, complex and too diverse cases
- Cases that require immediate laboratory tests
- Neurologic cases
- Mental health issues
- Symptoms of cases that require regular follow-up

The nature of the service model as a way of treating several patients simultaneously steers the service to more symptom focused direction focusing mainly on the most pressing issue of the patient, without putting emphasis on the examination of the overall situation of the patient. As on interviewee highlighted:

> *"The downside is that it is a very hectic job and you are very firmly glued to the bench for four hours. I feel that I cannot invest enough in the quality of care because it is a priority to efficiently try to solve the problem and end the discussion, because for example how the remuneration model is constructed. Many other value-added things are easily missed, and a broader examination of the patient's situation, what would be possible in that service model environment if there was a different framework agreed upon, is left undone"*

9.1.3 Sub theme: Technology emitted interaction in Digital Clinic

Interaction between the physician and the patient in the Digital Clinic environment arose as a highlighted topic and is one of the special characteristics of this kind of service model. Without face-to-face interaction all the non-verbal interaction is left out, but there were other issues raised as well, when relying on only text.

> *"interaction based on only writing is lacking many of the things you could observe, examine and do in a normal face-to-face situation. In addition, it is more difficult to explain and go through different things with the patient"*

Other issue brought up was the chance of a bilateral misinterpretation between the physician and the patient on what was truly meant. And as the service model is asynchronous, where there are several chat discussions open simultaneously, this causes delay in the interaction for both the patient and the physician. This was seen to raise the risk for misinterpretation and misunderstanding. It was seen, that more emphasis was needed in forming one's sentences in a way that the desired message was conveyed properly.

> *"Getting a written message through with the patient, especially when the patient may not respond immediately, is sometimes challenging. To know that did the patient now understood what I meant"*

> *"you have to pay much more attention to how your words are formulated and positioned. Because of the lack of expressions and gestures, it is up to the little things how that message is conveyed"*

Also forming trust between the patient and conveying empathy and compassion for the patient is more challenging based on just text. Especially from the perspective of customer experience this was seen as a relevant issue.

9.1.4 Sub theme: Potential future development

Based on the experiences from the Digital Clinic, the medical doctors saw several benefits of the service model for future development, regarding implications for health care service provision in general. Not taking resources or other financial requirements into account and focusing mainly on the potential of the service model, there were seen to be several features that could be utilized in a larger scale. For example, one interviewee highlighted that:

> *"If there would be enough resources, I see that there would be value in addressing every case initially remotely and only after that move them forward in the health care system. This way cases would go directly to the right "tube" and the assessment of treatment would be done this way. Even if the patient would need a physical examination at one point later on"*

The doctor chat service could be a complementing service for the traditional face-to-face reception, and it could relieve the pressure of cues at health stations for example. Based on the interviews many of the medical doctors saw that quite a big percentage of the cases treated in health stations could be cost-efficiently treated remotely using this kind of service model. These cases included for example follow up meetings with patients with diseases in a perfectly good treatment balance or also those basic diseases that require regular check-ups.

> *"It could also be combined with a traditional reception so that the remote reception would collect a medical history and essential information and then, if necessary, complement it with a brief live reception, which would then perform the necessary status tests and physically examine the patient. Any such combo would be completely possible and then it would create virtually endless possibilities"*

9.2 Theme: Expertise

Work of a medical doctor is challenging and demands knowledge and skills on several different areas of health care but other field as well. And as the doctors are key actors in adaptation of telemedicine services, the theme expertise clearly arose from the data collected from the interviews. The subject of working through the Digital Clinic was covered from many angles during the interviews, but most of the questions and subjects discussed during the interviews often ended in going through what is required from the doctor to successfully handle the work of a chat doctor in those areas which were individually discussed. This theme of expertise concentrated on the attributes and skills preferred for the work of chat doctor. Important part of the work of any physician is the professional skills and knowledge on medicinal aspects of the work and as the Digital Clinic has certain restrictions and as it is suitable only for a certain kind of medical services, there was a clear preferred professional background that was highlighted with the

interviews. But in addition to professional skills, there were several other attributes and skills highlighted with the interviews, that would be preferred for the work of a chat doctor with the Digital Clinic. As a result, two sub-themes emerged from the collected data.

9.2.1 Sub theme: Professional skills and knowledge

At the base of the professional skills needed for the work of any medical doctor is the educational background. As the Digital Clinic mainly focuses on general medicine, this was the preferred background that was highlighted with the interviews. Even though there are also several specialist working with the Digital Clinic and their value for peer consultation in their speciality related areas benefits the whole pool of doctors, most of the doctors working with the digital clinic were general practitioners. Most of the cases that can and are being treated in the Digital Clinic remain on the level of general medicine. In addition to general medicine, experiences from on-call type of work, from a health station for example, was highlighted as an especially suitable background for this kind of work as the nature of a fast pace on-call type of work is comparable to the work of a chat doctor. Following comments arose from the interviews:

> *"good clinical skills of a general practitioner are needed"*
>
> *"you should have at least a couple of years of just the right kind of general practitioner work in the background"*
>
> *"I think the experience of working as a general practitioner is the best background for it. If you are just specialized in some small specialty and have been there for years, it may be that the chat work is too fast for you"*

In addition to the educational background needed and preferred in the work of a chat doctor, bigger emphasis was put to the experience level required for the work. Experience level required for the medical doctors for the Mehiläinen Digital Clinic was mentioned in every interview. The main reason for the emphasis on the previous experience from treating a lot of patients face-to-face was connected to the nature of the remote work and to the specific characteristics when treating patients just based on text and images, namely with lack of information. Decisions on treatments had to be based on

lesser information and in these kinds of situations the experience of the doctor plays an important role.

> *"many of the young doctors would certainly be happy to jump in, but it is worth doing the basic work of a doctor and only after that move into work where you really have to make big decisions with less knowledge"*

> *"you must have the experience that you have seen enough patients there at the traditional reception so that you can suspect also those more serious scenarios from just limited amount of… let's say datapoints"*

> *"The telemedicine doctor should be an experienced physician. Because of the limited information available, it is a requirement to draw conclusions from experience"*

> *"you must have sufficient clinical experience. It is not enough to have just graduated and done six months of occasional on-call work. Yes, it should have been at least a couple of years of just the right kind of general practitioner work in the background to see those stumbling blocks there at the reception. Then you are able to tackle those potential hazards there in the digital clinic as well"*

Even as the previous experience from relevant work was highlighted in basically all the results, there were also few statements made, that there is also a thing of "too experienced" for this kind of work, as on interviewee pointed out:

> *"It is often said that you must be terribly experienced general practitioner, that you can work remotely. I do not agree with that statement. Some clinical touch from seeing patients is yes needed, but not that you should have had decades of work experience behind you. On the contrary, it can stifle certain types of action and slowdown your work"*

Besides professional knowledge and previous experience there were also a set of other skills and attributes regarding the professional skills and knowledge subtheme, which were through the coding process categorized under the subclass, named working life

skills. These related once again to the special characteristics and features of the Digital Clinic chat doctor work.

One requirement, that was brought up especially for the chat doctor work, was the ability to recognize efficiently which patient cases can be treated with the Digital Clinic and which cannot. This was mentioned in several interviews to be one of the biggest challenges for a doctor, who is just beginning to work as a chat doctor. This relates to the professional skills of the doctor but also to the previous experiences from telemedicine. The peer consultation through the Slack channel play an important role especially for the new Digital Clinic doctors, as they can get consultation from the more experienced chat doctor colleagues practically instantly. Even though many of the cases of the patients in Digital Clinic are quite "simple and straightforward", as mentioned by one interviewee, taking the scenario to remote channels brings new set of requirements to the table. As it was mentioned in one of the interviews:

> *"things that are easy and straightforward face-to-face, can be remotely more difficult and can easily go into wrong direction, if you don't have that experience there backing you up"*

When the peer consultation is in an important role for medical doctors and especially in telemedicine, other teamwork and social skills matter as well. As there is no face-to-face interaction between the doctors either, trust and interpersonal skills are important and demands also special attention. Especially the ability to stick with agreed policies came up in several interviews. This relates to both the official recommendations for care and to the rules and guidelines for the actual work with the Digital Clinic. It was pointed out that because there is lesser amount of information available and because most of the cases are straightforward enough to follow official recommendations for care, in telemedicine there is even less reasons to deviate from those recommendations.

> *"remotely it is rarely justified to depart from the official treatment recommendations. Then it goes easily into wrong direction, also in quality. Exceptions to those recommendations might be warranted in individual cases at face-to-face reception, where there is a specific situation. Remotely, we often do not have enough reasons to go about doing something different from what is officially recommended"*

Agreeing and following the rules and guidelines of the operational side of the work relates to for example the remuneration structure of the doctors and how the patients are divided between the doctors. Sticking to the common rules and the trust between fellow colleagues within the Digital Clinic were brought up with in several interviews.

9.2.2 Sub theme: Personal attributes

One feature of the doctor chat work, that was also highlighted in the interviews, was the hectic nature of the work. There is no possibility to affect to the pace of how many patients will be contacting the Digital Clinic on any given work shift (usually 4 hours). As there is the guarantee for the patients to be replied within an hour, during a busy flu season for example, the pace can get quite fast and there is practically always more than one patient chat open simultaneously. This sets requirements for the doctor to be able to continually provide safe and good quality service to the patients under pressure.

> *"it's pretty hectic. In my opinion, it is comparable to an emergency clinic-style activity. Often, the observation is that those doctors who gets "kicks" from a busy on-call type of work, that involves multitasking in the middle of constant hurry, are the ones who also like the Digital Clinic work"*

Stress management and problems solving skills are hardly absent in any kind of medical doctor's profession, but these skills were mentioned in every one of the interviews. The hectic pace of the chat doctor work, treatment of several patients simultaneously and the fact that decisions must be made based on lesser information, raises the requirements for stress management and working under pressure.

9.3 Theme: Training for telemedicine

Educational background and the continuous professional development are important factors for the highly monitored and regulated field of health care, especially from the point of a medical doctor. Because of this, previous educational background and training for telemedicine was a part of the research for both the qualitative and quantitative phases. As a part of the interviews in the qualitative phase, the participants were asked the following question:

"How was telemedicine and digital health services covered as a subject during your medical studies?"

As the age distribution of the interviewees varied between 32 and 58 years, there were naturally some differences between the contents of the curriculums of the participants' medical training. But, discussing especially the subject of telemedicine, the results from all the interviews were very similar:

"Very little, if any"

"No, none. And before I started with the Digital Clinic in 2017... yes, I had heard about remote reception, but it was somehow a strange subject and I can't recall the subject covered during studies at all"

"I do not remember that there was anything to do with the subject. There were some pilot projects, for example, in Oulu for video consulting, where parents were advised on the treatment of childhood ear infections, etc., but they were very small pilot projects"

All the results from the interview showed the telemedicine was not a part of the curriculum and the subject was covered very little, if any. The quantitative questionnaire researched the same topic with a similar question:

"On a scale of 1 to 3, how much was telemedicine covered as a topic during your medical studies? (1 = not at all, 2 = briefly mentioned, 3 = topic was covered thoroughly)"

Figure 9 illustrates the results for this question from all the participants (n = 435).

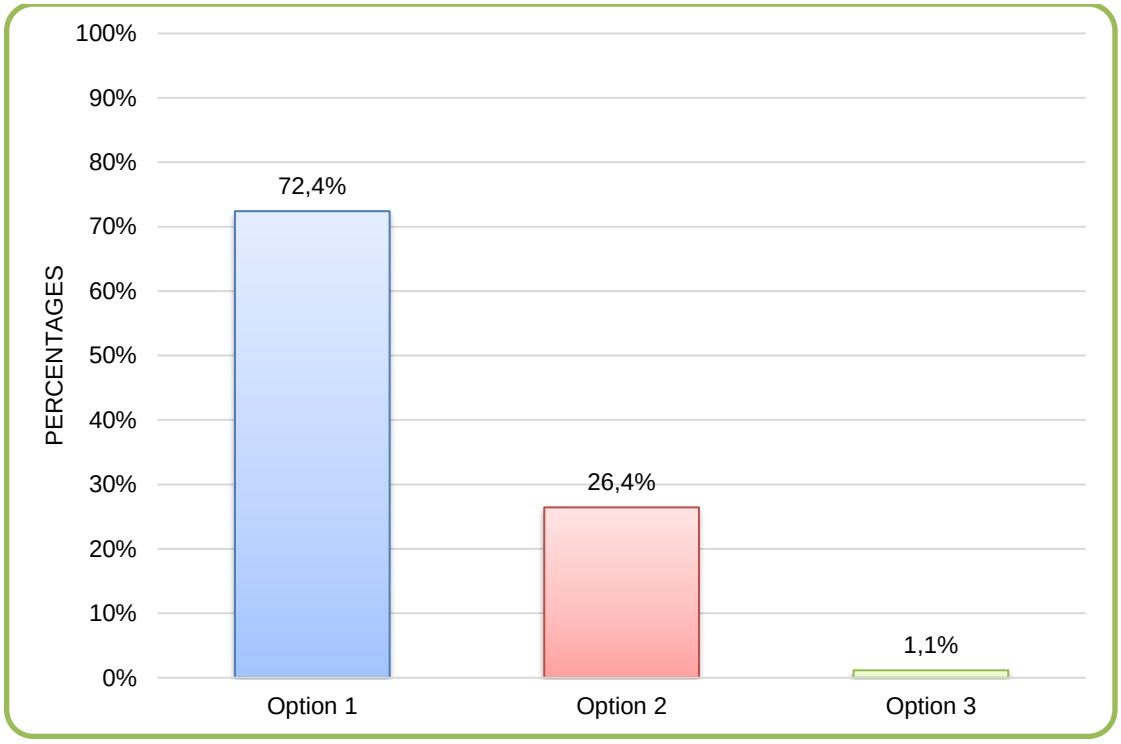

Figure 9: Was telemedicine covered as a subject during medical studies (all participants)

Results from the qualitative phase showed similar findings as a clear majority of 72,4% (n = 315) of the participants hadn't had telemedicine covered as a topic during medical studies at all. For the purpose of investigating if there would be any changes to the results, when taking the development of recent years into account, the results from this particular question of the questionnaire was filtered to show the results only from those participants, who were still medical students (9% from the total amount of participants, n = 39) at the time of conducting the questionnaire. After filtering the results, there were some changes visible, as can be seen in the figure 10.

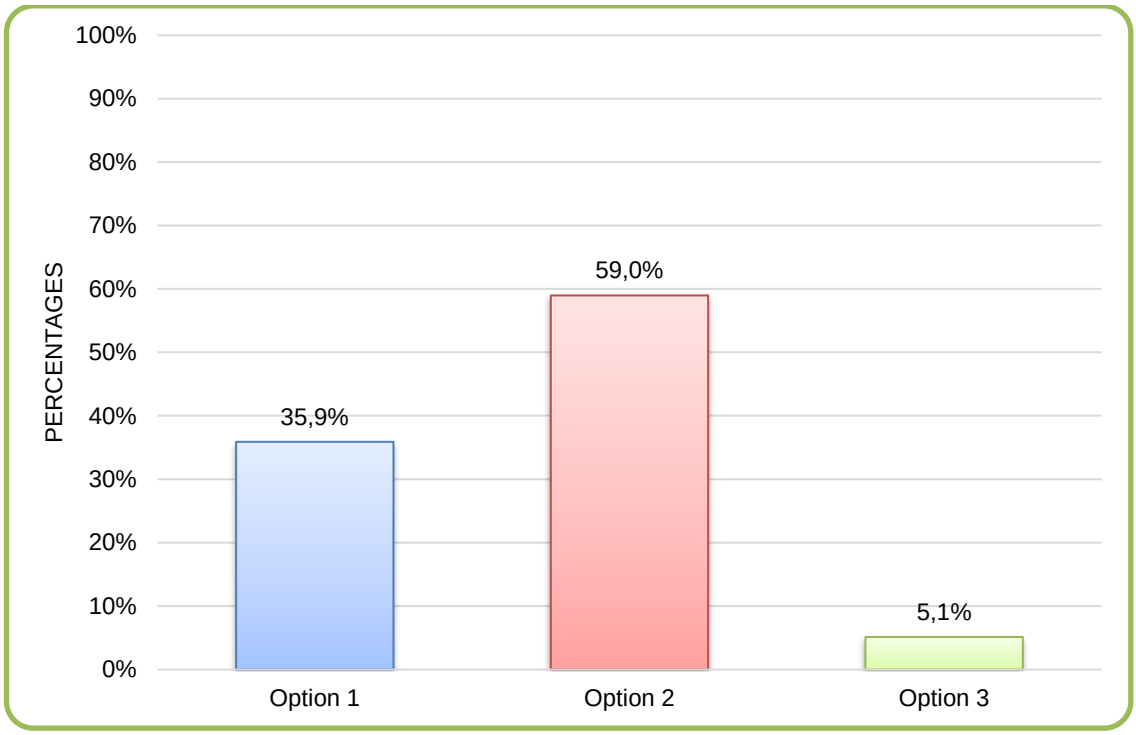

Figure 10: Was/is telemedicine covered as a topic during medical studies (participants currently still in medical school)

10 Discussions

Observing the current state of global health care and taking the challenges of the future into account, it seems inevitable that the many forms of telemedicine will continue to develop and change and affect the way people receive and manage their health services now and in the future. This will and has already affected also on how health care professionals deliver their services. In response to the research questions of this study, the aim for this case study was to inspect one form of telemedicine service, namely an online doctor chat service, more thoroughly and to provide an example of the digitalization of health care in practice. The subject was approached from the medical doctor's point of view and through their perceptions and experiences the goal was to gain more insight on the special characteristics of this form of clinical work and on the overall perceptions and attitudes towards telemedicine in Finland in general.

Regarding the first research question on the perceived values and benefits of this kind of service, the benefits for the doctors were clear. In addition to the benefits of temporal and geographical flexibility, that are present in most remote work in general, telemedicine

helps in managing and planning one's workload and for medical doctors, who many works as a solo-practitioner or as an entrepreneur, telemedicine services enables working also during maternity leaves, sick leaves or other longer periods without the possibility to work normally at the workplace. In addition, several doctors felt, that they could be even more efficient in their work, while working remotely and that the load and the stress from work was easier to manage. Examining the benefits of this kind of service model deeper, many of the benefits of physicians were linked with the benefits of the patients. Many of the doctors experienced that the doctor chat service lowered the threshold for patients to get themselves to contact a doctor in the first place, but to also talk more freely about the issues that were bothering them. It is easier for the patient to discuss about sensitive issues and the more anonymous way of going to a doctor was seen to help relieve also anxieties in these kinds of situations, that some may experience. This way patients got proper treatment faster and easier. In those cases, where this kind of service, based only on text and images, is suitable, the service clearly has its place. And when thinking about the efficiency, the potential for future development of this kind of service model, the scalability of it and the potential of it in helping many of the issues that health care is facing in the future, it is hard to ignore also the societal benefits it could bring.

But, this kind of chat doctor service is not for every situation, as it is not intended to be. In reference to the second research question about the perceived shortcomings and risks of this kind of chat doctor telemedicine service, there were some that related simply to the restrictions of not being in the same room with the patient but there were also issues regarding the special characteristics of treating patients with only text and images. Obviously, the inability for physical examination of the patient, brings own restrictions on what kind of cases can be treated through this kind of service. In addition, the way the physician and the patient interact during the "visit", brought up some risks and concerns as well. As big part of telemedicine is based on the preliminary knowledge or the anamnesis of the patient, this raises the role of the patient as well. With the Mehiläinen Digital Clinic, the automated symptom survey in the beginning of a new session is designed to help narrow down the cause of the visit more efficiently. But other than that, the physician must rely on the information the patient gives and when all the non-verbal communication is lacking, this raises the risk of misconception, especially when only chatting. As LeRouge et al. (2012: 623-624) suggested, when the interaction with telemedicine is technology emitted, there is a risk of making the process more complex for all actors.

This is a clear characteristic of this kind of service and this raised also as a clear shortcoming from the results of this study. Even though the role of the patient was more or less left out from the scope of this study, or it was at least not covered in-depth, with telemedicine the role of the patient changes as well. The patient's ability to really interpret and especially describe her/his symptoms clearly affects the success of telemedicine delivery, especially in a chat-based model. This is a matter that should be considered and perhaps researched more, for the benefit of the medical doctors treating patients through telemedicine but also for health care organizations developing their telemedicine services in the future.

Other possible risk with this kind of doctor char service is the symptom focused approach that Mintzberg (2017 :16) was also implying and how the development of health care services focuses more on treating symptoms, rather than preventive care. This was brought up also in one of the interviews and how the broader examination of the patient's overall situation is left undone, because the focus is on solving the most acute problem and then moving on to the next patient. Nevertheless, the efficiency of this kind of model is hard to deny and it came clear, that this kind of service platform could also be used in a broader way, for the purpose of preventive care, with different kind of agreed framework.

The third research question referred to the expertise of a medical doctor for the work of a chat doctor. Based on the results from the interviews and the questionnaire, telemedicine and the possibility of remote work generates interest among medical doctors, even though first-hand experiences on telemedicine service delivery is still quite limited for many. Experience was especially highlighted with practically all the interviews. It became clear that at least a few years of experience from an on-call type of general medicine work is needed in this kind of work, or at least preferred. Again, when relying just on text and sometimes images, the amount of data for making diagnoses, reduces drastically. Some basic senses for observing the patient cannot be utilized and the lack of gestures and non-verbal communication means that a chat doctor must make decisions with a lot less information. Here is where the previous experience from face-to-face reception work can make a difference. Having seen and experienced enough of different kind of cases and having treated enough of patients from young children to elderly people helps to find the right diagnosis with less information available. In addition, the hectic nature of the

work of a chat doctor brings added requirements for stress and time management, because usually several patients have to be treated simultaneously. Professional skills and other working life skills are essential for a chat doctor, like for many other professionals as well, but as the continuing professional development is vital for a medical doctor, training for telemedicine itself was also one relevant part of this case study, as it affects ultimately also on the perceptions and adaption of telemedicine in general.

As Saini and Jaiya (2020: 170) stated, if the training for telemedicine is insufficient and it is not taught in medical schools, doctors might be hesitant to try telemedicine. Training for telemedicine was covered with both the interviews and the questionnaire. Results from both phases of the research showed, that for a vast majority of the participants, from both the interview and the questionnaire, telemedicine was not taught as a topic during their medical studies at all. After filtering the results from the questionnaire to show answers from only those participants, that are currently still in medical school, there had been some progress and apparently eHealth and telemedicine was being included into the curriculums more so. Still, when examining the curriculums from all five universities, that offer the degree programme in Medicine, only the university of Oulu seemed to have a dedicated course on eHealth, as an elective course.

As the digitalization of health care moves forward, training for telemedicine will also most likely increase in universities. But as this will take time, the importance of leadership and support for telemedicine, in organizations that provide telemedicine services today, is highlighted. In this case study, the concept of electronic Communities of Practice (eCoP), introduced by Ho et al. (2010), was seen in practice with the Slack channel of the Digital Clinic. The Slack channel functioned as an instant source of peer consultation, channel for development of the overall service and as channel for informing relevant and urgent matters in general. The importance of leadership with the eCoPs was highlighted as according to Sergi, Comeau-Vallée, Lusiani, Denis & Langley (2016: 210), health care organizations tend to deal with complex and multi-dimensional issues. CoPs in health care organizations often include highly educated and strong identities and this brings added challenge to the organization of the leadership, especially when dealing with change initiatives. This should be considered when organizing eCops. Nevertheless, especially as the training and education for telemedicine as a part of medical studies is still limited, this kind of learning through promotion of knowledge transfer and sharing is important (Nicolini, Scarbrough & Gracheva 2016: 271-272).

The overall perceptions and attitudes of telemedicine was examined with the fourth and final research question. As according to Saini and Jaiya (2020: 170), medical doctor play an important role in the adoption of telemedicine and for this reason the main purpose for the questionnaire was to survey the overall perceptions towards telemedicine currently within the community of medical doctors in Finland. The emphasis on the results was in the questionnaire, but the topic was covered also with the interviews. As mentioned, telemedicine raises interest among the doctors, but there is still scepticism towards it, partly due to the lack of first-hand experience and partly due to the lack of training. Still, the results from the questionnaire showed, that big portion of the participants were interested in telemedicine and the importance of it was acknowledged. Even if the opinions seem to be quite polarized and there still was a lot of scepticism towards it, attitudes have been going to more acceptable direction lately and as one of the interviewees summed it:

> *"I think that attitudes are kind of cautiously curious. This type of teleworking is of enormous interest to many and, as a result, I am sure that many are waiting for what will happen in the industry in the future"*

11 Conclusions

This thesis provided a case study on an online doctor chat service, with the emphasis on the work of the medical doctor and the aim was to provide a case of digitalization of health care in practice, with information, guidelines and examples of this kind of chat doctor service in practice, for the current and future chat doctors, for the service providers developing their telemedicine services and ultimately to the whole sector of health care. This study focused on a doctor chat telemedicine service model from the perspective of the work of a medical doctor, through a case study with the Digital Clinic of Mehiläinen. The technical implementation of a doctor chat service or the technical and IT requirements for a medical doctor working through the Digital Clinic was left out from the scope of this study. Also, all financial implications and aspects of this kind of health care service delivery was intentionally left out from this study.

11.1 Reliability of the study

As the interviewees for the qualitative phase of the research was chosen using the purposive sampling technique (Kananen 2008: 75-76), the collected data represented the experiences and perceptions of the more experienced side of the medical doctors working with the Digital Clinic, experienced especially from the work of a chat doctor. The number of interviews seemed to provide clear adequacy for data saturation and therefore the results of this study should be fairly generalizable. Although, the objectivity of the medical doctors, who have all already adopted this form of telemedicine work, can be questioned. Still, the conclusion of the author is, that the experiences and the results from the interviews depicted a fair and objective overall view of the subject. And to validate and strengthen the findings of this case study, the results from the questionnaire, representing the perceptions and views of a 435 medical doctors and medical students, gave an objective and reliable enforcement to the study.

11.2 Ethical considerations

As recommended by the Metropolia University of Applied Sciences, this Master's Thesis was conducted in accordance with the responsible conduct of research (RCR) guidelines set by the Finish Advisory Board on Research Integrity (TENK) and the Rectors Conference of Finnish Universities of Applied Sciences (Arene). All the participants in the interview and questionnaire processes were informed about the background and the purposes of the research and that all their information would be used with total anonymity ensured. Participation to the interview and to the questionnaire was made to be completely voluntary (Finish Advisory Board on Research Integrity 2012: 6-7).

In addition, other principles, such as, reliability, honesty, respect and accountability, published in the practical guide by The European code of conduct for research integrity, was taken into consideration conducting this research (European Code of Conduct for Research Integrity 2017: 4,5).

11.3 Suggestions for further research

As this case study focused on the perspective of a medical doctor in this kind of form of telemedicine, the other main actor of the interaction, the patient, would also make an

important research subject. As the results of this case study showed, the role of the patient is highlighted with telemedicine, especially with the chat-based service. The ability of the patient to identify and describe symptoms correctly is important for the success of the service delivery. And as important is the role of the doctors in adopting and making telemedicine more common, one might argue that the role of the patient is as equally important. It could be seen beneficial to research also the patients experiences and perceptions on this kind of service and one important goal for this kind of research could be to educate the patients on this kind of service. If they would be better informed, on which kind of cases can be treated with chat-based doctor service and which are not suitable, this might help also the patients to find telemedicine and start adopting it into their normal way of using health care services.

There are several forms of telemedicine and many of them would be suitable for a new case study. The one that was brought up and discussed also during this case study, was the reception through video conference sessions. Even though video conference session does not have the advantage of treating several patients simultaneously and the service might not be as easily accessible for the patient, as the mobile chat doctor services, there are still benefits to video conferencing, that are lacking with the chat service. One area that was not seen as a suitable speciality area for the chat doctor service, was mental health issues. This is one clear area where video conference sessions have the advantage and it was brought up also in this case study, that psychiatry is a very suitable speciality area for video conferencing. But as there is potential in video conferencing for even wider use in telemedicine, this would also make a suitable research topic.

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Appendix 1: Interview participants

Interview #	Occupation	area / speciality	Date of Inter-view	Lan-guage
1	Medical doctor	general practitioner	17.5.2019	Finnish
2	Medical doctor	general practitioner	22.5.2019	Finnish
3	Medical doctor, speciality medicine	surgery	29.5.2019	Finnish
4	Medical doctor	general practitioner	6.6.2019	Finnish
5	Medical doctor, speciality medicine	general medicine	12.6.2019	Finnish
6	Medical doctor	general practitioner	19.6.2019	Finnish
7	Medical doctor, speciality medicine	psychiatry	16.8.2019	Finnish
8	Medical doctor, speciality medicine	general medicine	19.8.2019	Finnish
9	Medical doctor, speciality medicine	general medicine	20.8.2019	Finnish
10	Medical doctor	general practitioner	20.8.2019	Finnish
11	Medical doctor	general practitioner	22.8.2019	Finnish
12	Medical doctor	general practitioner, PhD	15.10.2019	Finnish
13	Medical doctor, speciality medicine	pediatrician, docent	18.10.2019	Finnish
14	Medical doctor	general practitioner	3.3.2020	Finnish
15				
16				
17				
18				

Appendix 2: Qualitative research interview questions

1. What is your background? (age, education, specialities)
2. Can you describe to me what a normal working day/shift in Digital Clinic is for you?
3. What is your previous experience with telemedicine before you started working with Mehiläinen Digital Clinic?
4. How was telemedicine and digital health services covered as a subject during your medical studies?
5. What was the main reason/motivation for you to start working with the Digital Clinic?
6. How have you experienced telemedicine work?
7. What kind of special characteristics in your practical work have you encountered when treating patients remotely?
8. Have you noticed something special with the behaviour of the patient, when there is no face-to-face contact with the physician?
9. Based on your experiences working through the Digital Clinic, what kind of pros/cons comes to mind with the concept of telemedicine?
10. Based on your overall observations and experiences, how is the practice of tele-medicine perceived among the community of physicians in Finland currently?

Appendix 3: Quantitative research questionnaire

1. What is your background (medical student, general practitioner or speciality doctor)?
2. Where do you work? (1 = Hospital, 2 = Clinic, 3 = University, 4 = other)
3. Do you work in private or public health care? (1 = private, 2 = public, 3 = both, 4 = other)
4. How old are you? (1 = 20-25, 2 = 25-30, 3 = 30-35, 4 = 35-45, 5 = 45-55, 6 = 55+)
5. Do you have previous experience in telemedicine as a service provider (yes/no)?
6. If you do not have previous experience on providing telemedicine services, on a scale of 1 to 5, how interested you are to try telemedicine as a method to provide health services to your patients? (1 = not interested at all, 2 = somewhat interested, 3 = undecided, 4 = interested, 5 = very interested)
7. As a part health care services in the future, how important do you see the development of telemedicine services and digital health care tools in general? (On a scale of 1 to 5, 1 = not important, 2 = somewhat important, 3 = undecided, 4 = important, 5 = very important)
8. On a scale of 1 to 4, how often have your patients asked about or requested remotely provided health services? (1 = never, 2 = seldom, 3 = often, 4 = regularly)
9. On a scale of 1 to 5, how open minded is your current work community and employer to the digitalization of health care and digital tools for providing care to patients (1 = not open minded at all, 2 = somewhat open minded, 3 = I don't know, 4 = open minded and interested, 5 = very open minded and interested)
10. On a scale of 1 to 3, how much was telemedicine covered as a topic during your medical studies? (1 = not at all, 2 = briefly mentioned, 3 = topic was covered thoroughly)
11. On a scale of 1 to 5, how important would it be to include telemedicine and the digitalization of health care as a topic to the future curriculum of medical studies? (1 = not important at all, 2 = somewhat important, 3 = undecided, 4 = important, 5 = very important)
12. Based on your overall observations, how is the practice of telemedicine perceived among the Finnish medical community as a viable way of practicing medicine

alongside with traditional way of working? (1 = telemedicine is not a reliable option at all, 2 = telemedicine might work in some cases, 3 = undecided, 4 = telemedicine is a viable option, 5 = in cases where telemedicine can be utilized, it is just as viable option as a traditional way of working)